

2182D-11680 (AUMS/SEG)

28 April 2008

OXYGEN SYSTEM COMPATILITY  
TEST – CF188 NACES CONFIGURATION

Ref: A. Telecons Ellis/Michas/Gordge 28 Aug 2007  
B. Tasking Project Definition, 2182D-11680(DTAES 7-4-2), 12 Oct 07  
C. Telecon Michas/Rioux, Jan 08

BACKGROUND

1. The CF188 fleet will be retrofitted with the SJU-17 ejection seat also known as the Navy Aircrew Common Ejection Seat (NACES). A change in oxygen system plumbing is associated with the retrofit. There is a requirement to confirm oxygen system compatibility specifically between the SABRE regulator and plumbing for the CF188 NACES configuration (Ref A), and DRDC Toronto was tasked accordingly (Ref B).

AIM and OBJECTIVES

2. The aim of this task was to confirm compatibility of the oxygen SABRE regulator and plumbing configuration in CF188 aircraft equipped with the NACES SJU-17 ejection seat. The objective was to conduct tests throughout the oxygen system operating range.

3. Although the inner configuration of all parts is not visible, the apparent physical change to the oxygen system for NACES is a slight increase in the most relevant dimension, namely inside diameter. The expected impact would be to improve overall system performance. Direct comparative testing between the configurations was considered unnecessary (Ref C).

EQUIPMENT UNDER TEST

4. The test item comprises CF188 oxygen system components in the NACES configuration from the pull-disconnect interface between the aircraft supply and seat kit to through to the aircrew oxygen mask including seat kit and Sabre oxygen regulator.

METHOD

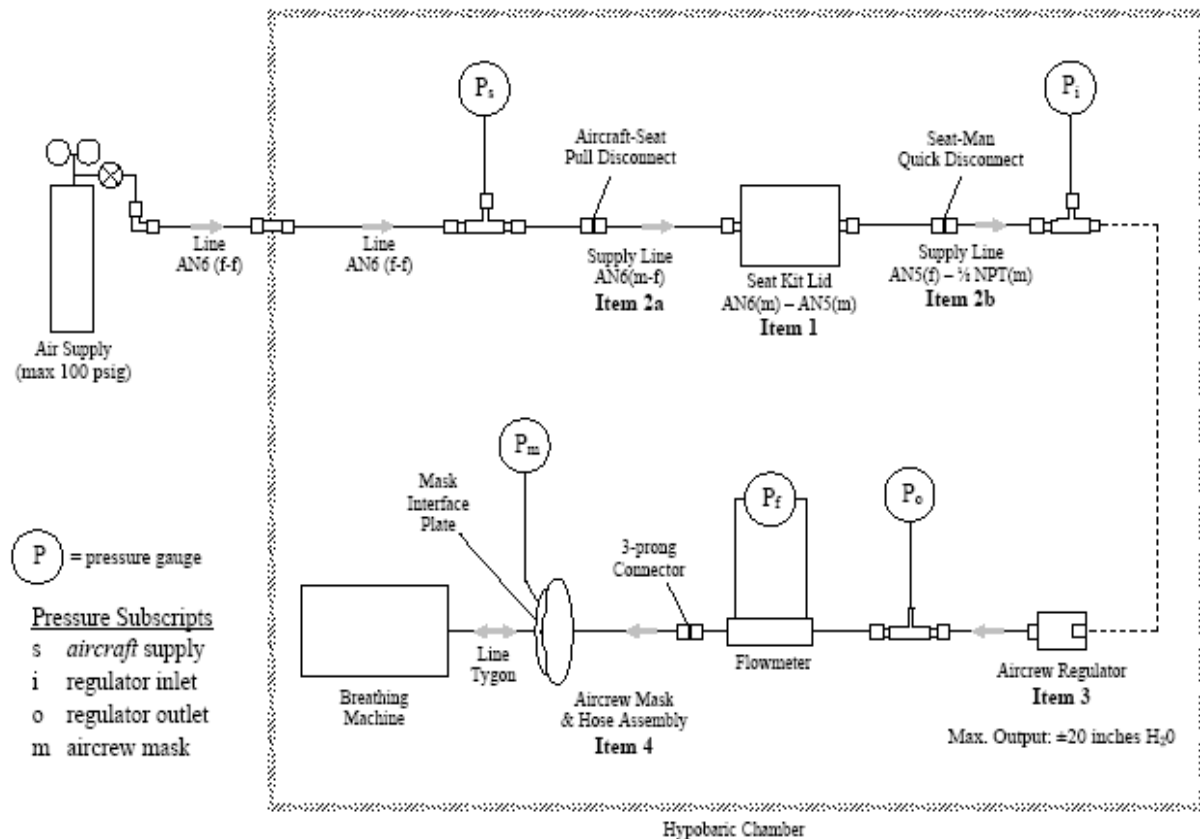
5. Testing was conducted in the hypobaric chamber at DRDC Toronto. Test set-up was as illustrated in Figure 1. A total of 84 tests were conducted with variable settings as summarized in Table 1 comprising a common baseline test<sup>1</sup> and five test groups for examining effects of varied parameters:

- a. inlet pressure ( $P_{in}$ ) – 18 tests;
- b. mode (M) – 7 tests;
- c. altitude (H) – 28 tests;
- d. multiple extremes – 16 tests; and
- e. breathing profile – 14 tests.

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<sup>1</sup> The single baseline test is applicable in comparisons within each *parameter effect* group.

Figure 1. NACES oxygen system compatibility test setup



Gas medium used in the test system was air with inlet (simulated aircraft supply) pressure set at approximately 40, 70 (*normal*) and 100 psig. The oxygen regulator was tested in both operating modes: *dilution* (D) and *100% oxygen* (100%). Test altitude (H) ranged from ground level (where mass flow and likelihood of unusual characteristic is highest) to 45,000 feet, with three selected intermediate settings. Various dynamic sinusoidal flow-time profiles, from very low to very high rates, were generated using a programmable breathing machine interfaced with the oxygen mask. Ranges of breathing rate, minute volume (or average flow,  $f_{avg}$ ) and peak inspiration flow ( $f_{pk}$ ) were, respectively, 8-22 breaths per minute (bpm), 5-40 lpm minute and 30-250 lpm. Expiration was a sinusoidal profile over a fixed time interval, with range of peak flow 40-310 lpm (determined by tidal volume).

6. Test interval was 90 s with the following continuous (50 Hz) data measures:
  - a. inspiration flow at mask hose (Fleish pneumotach); and
  - b. pressure (Validyne transducer):
    - 1) aircraft supply before pull-disconnect;
    - 2) regulator inlet;
    - 3) regulator outlet, or mask hose; and
    - 4) mask cavity.
7. Data were examined for trends and any sign of undesirable characteristics such as unstable, excessive or insufficient pressure, the latter reflecting gas supply “starvation”.

## RESULTS and DISCUSSION

8. Results are presented graphically in Annex A on a separate sheet for each test, sheets in turn comprising separate panels of breathing machine (flow generator) position, demand (“inspiration”) flow and the four measured pressures.
9. The data shows that pressures are consistently and highly responsive to flow demand regardless of breathing rate (number of breaths per minute) and minute volume (average demand per minute). Flow demand is successfully achieved in all conditions. Pressure responds to the breathing cycle and becomes stable immediately in that successive cycles are essentially identical. Higher frequency oscillations typical in 100% mode (e.g., Test 20) are attributed to regulator and mask characteristics and considered of negligible consequence. Mask pressure appears to be determined more by mask resistance characteristics than the oxygen supply system, with magnitudes during the breathing cycle (minimum, maximum and swing) consistently greater than those at the regulator outlet. There is no evidence of insufficient supply pressure (regulator “starvation”) even at low setting, 100% mode and extreme flow demand (e.g., Tests 17, 66). Multiple parameter changes seem consistent with combined effects of individual parameter changes. Overall, no anomalies or areas of concern are evident regarding the NACES breathing system configuration.
10. A few expected trends and known oxygen system properties were seen as follows:
- Safety pressure in *dilution* mode at 30K (e.g., Test 41), in 100% mode at low altitude (e.g., Test 20). The same level of positive pressure at high altitude in both operating modes (e.g., Test 60 vs 68).
  - Slight decrease in mask pressure (minimum, maximum & swing) as altitude increases through 15K (e.g., Test 1 vs 27 vs 34), attributed to less mass flow at altitude for a given volume demand.

## CONCLUSION

11. Results of the extensive tests here of the NACES oxygen system configuration, in each regulator mode and over the expected operating range for inlet pressure, altitude and breathing profile, individually and in combination, demonstrate acceptable performance and confirm compatibility among system components.

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30 Apr 08

Date

Reviewed:

  
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30 Apr 08

Date

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Table 1. CF188 NACES Oxygen System Compatibility Tests

M regulator operating mode

D dilution

P<sub>in</sub> air supply pressure

H altitude

R breathing rate

F<sub>avg</sub> average flow, or minute ventilationF<sub>pk-in</sub> peak flow in breathing cycle

GL ground level

Empty cells: baseline (bold) values applyVertical bar: value above applies

Series	Test #	M	P <sub>in</sub> (psig)	H (Kft)	R (bpm)	F <sub>avg</sub> (lpm)	F <sub>pk-in</sub> (lpm)
1 Baseline	1	<b>D</b>	<b>70</b>	<b>GL</b>	<b>15</b>	<b>20</b>	<b>120</b>
2 Supply Pressure	1	<b>D</b>	<b>70</b>	<b>GL</b>	<b>15</b>	<b>20</b>	<b>120</b>
	2				8		
	3				22		
	4		40				
	5						
	6				8		
	7				22		
	8					5	30
	9					37.5	225
	10						80
	11						200
	12		100				
	13						
	14				8		
	15				22		
	16					5	30
	17					37.5	225
	18						80
	19						200
3 Mode	1	<b>D</b>	<b>70</b>	<b>GL</b>	<b>15</b>	<b>20</b>	<b>120</b>
	2				8		
	3				22		
	20	100%					
	21				8		
	22				22		
	23					5	30
	24					37.5	225
	25						80
	26						200
4 Altitude	1	<b>D</b>	<b>70</b>	<b>GL</b>	<b>15</b>	<b>20</b>	<b>120</b>
	2				8		
	3				22		
	27			7.5			
	28				8		
	29				22		
	30					5	30
	31					37.5	225
	32						80
	33						200
	34			15			
	35				8		
	36				22		
	37					5	30
	38					37.5	225
	39						80
	40						200

Series	Test #	M	P <sub>in</sub> (psig)	H (Kft)	R (bpm)	F <sub>avg</sub> (lpm)	F <sub>ok-in</sub> (lpm)
4 (con't) Altitude	41			30			
	42				8		
	43				22		
	44					5	30
	45					37.5	225
	46						80
	47						200
	48			45	8		
	49				22		
	50					5	30
	51					37.5	225
	52						80
	53						200
	54						
5 Multiple Extremes	1	<b>D</b>	<b>70</b>	<b>GL</b>	<b>15</b>	<b>20</b>	<b>120</b>
	2				8		
	3				22		
	55		40	7.5	8	5	50
	56					20	200
	57				22	5	50
	58					40	250
	59			45	8	5	20
	60					20	80
	61				22	5	20
	62					40	160
	63	100%		7.5	8	5	50
	64					20	200
	65				22	5	50
	66					40	250
	67			45	8	5	20
	68					20	80
	69				22	5	20
	70					40	160
6 Breathing Profile	71				8	5	30
	72					10	60
	2					20	120
	73					5	30
	74					10	60
	1	<b>D</b>	<b>70</b>	<b>GL</b>	<b>15</b>	<b>20</b>	<b>120</b>
	75					30	180
	76					37.5	225
	77					5	20
	78					20	80
	79					37.5	150
	80					5	50
	81					20	200
	82				22	10	60
	3					20	120
	83					30	180
	84					40	250

# DRDC Toronto TN 2008-072 Annex A – Test Results

## CF188 Oxygen System Compatability Test - NACES Configuration

Group: 1 - Baseline

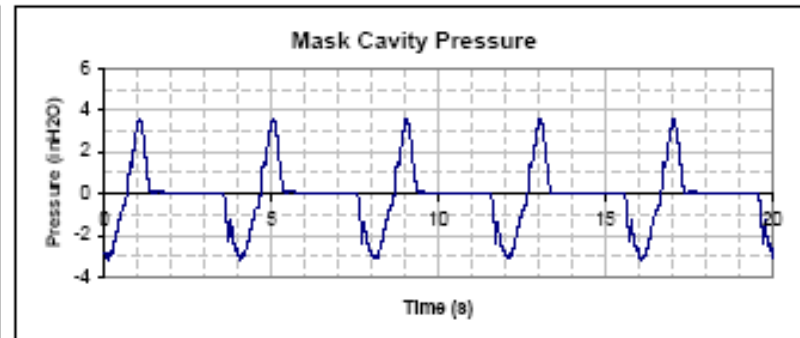
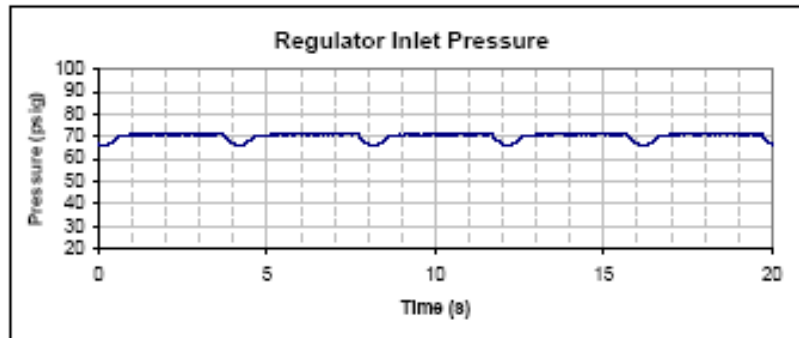
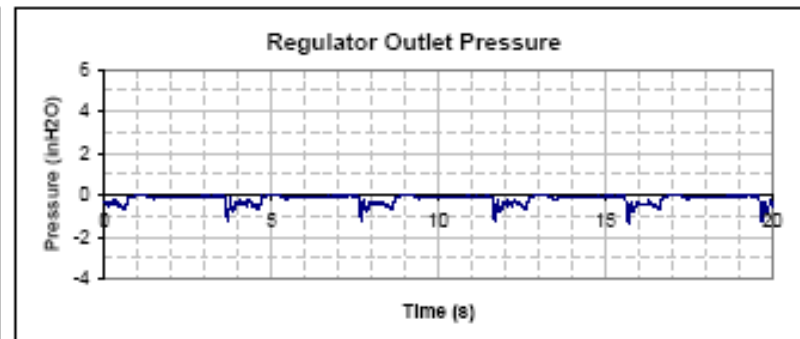
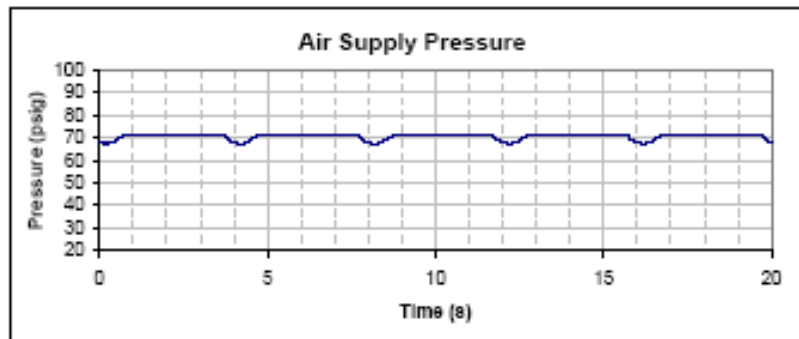
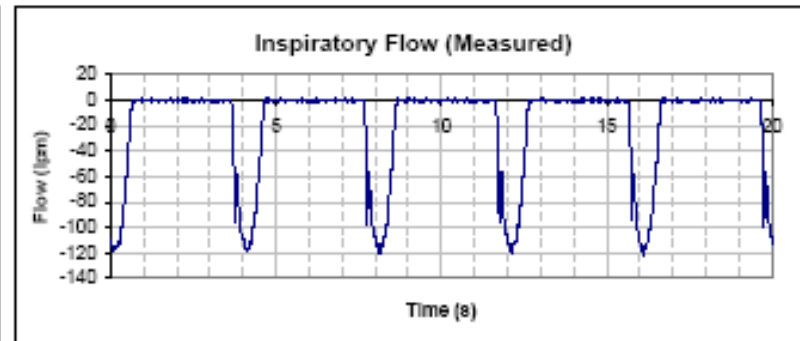
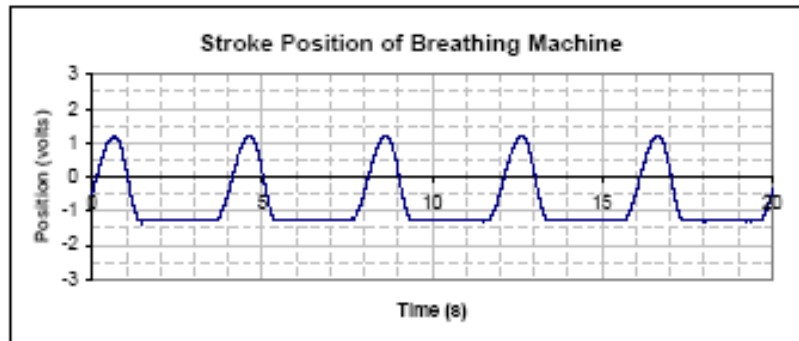
Test #: 1

### Settings

Breathing Rate (bpm) 15  
Stroke Volume (l) 1.33

Minute Volume (l) 20  
Peak Inspired Flow (lpm) 120

Altitude  
Inlet Pressure (psig) 70  
Regulator Mode  
Dilution



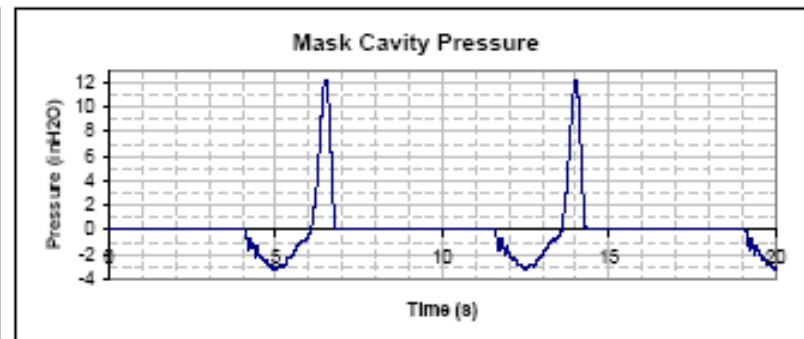
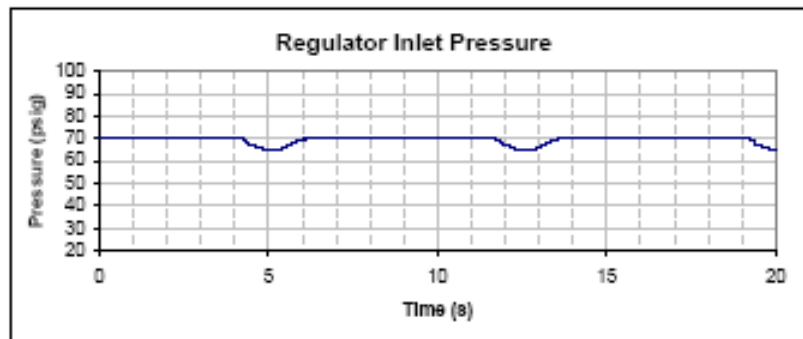
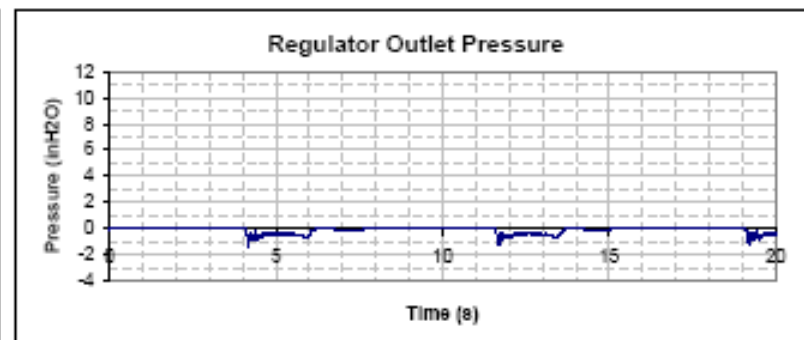
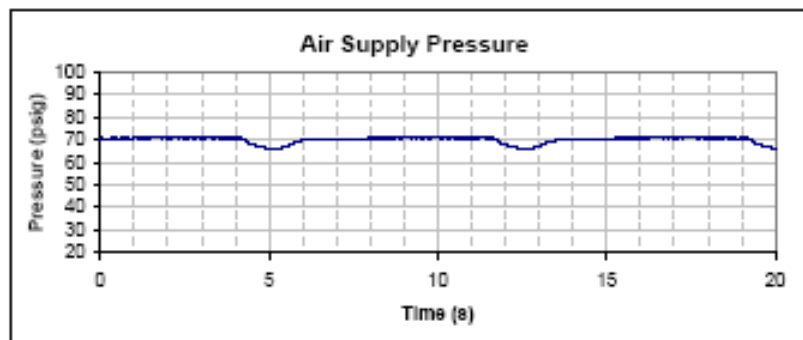
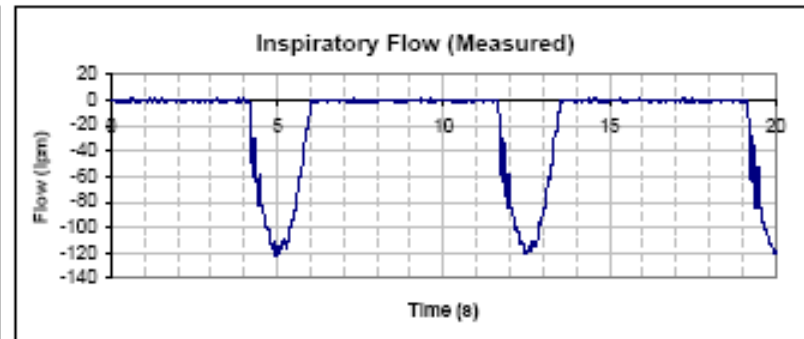
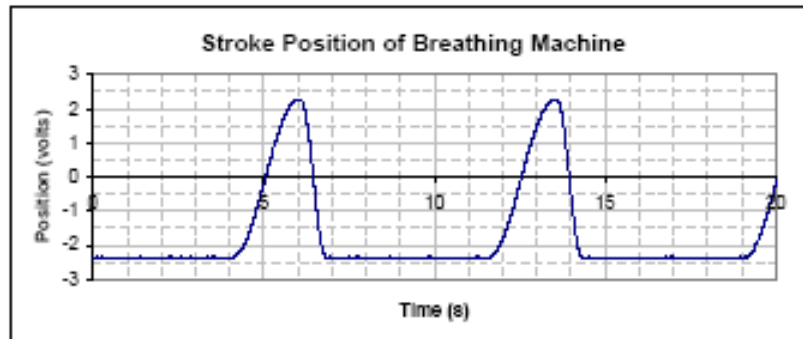
# DRDC Toronto TN 2008-072 Annex A – Test Results

## CF188 Oxygen System Compatability Test - NACES Configuration

Group: 2 - Varied Inlet Pressure    Settings

Test #: 2    Breathing Rate (bpm)    8  
Stroke Volume (l)    2.5

Minute Volume (l)	20	Altitude	GL
Peak Inspired Flow (lpm)	120	Inlet Pressure (psig)	70
		Regulator Mode	Dilution





CF188 Oxygen System Compatibility Test - NACES Configuration

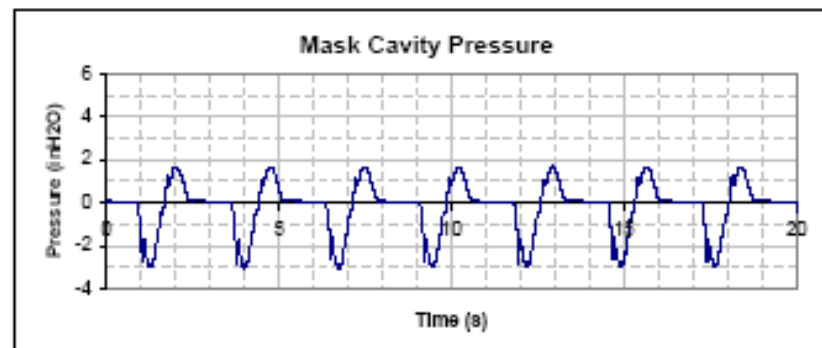
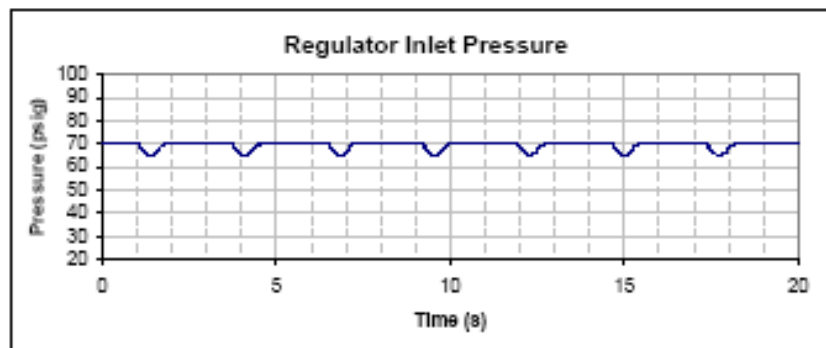
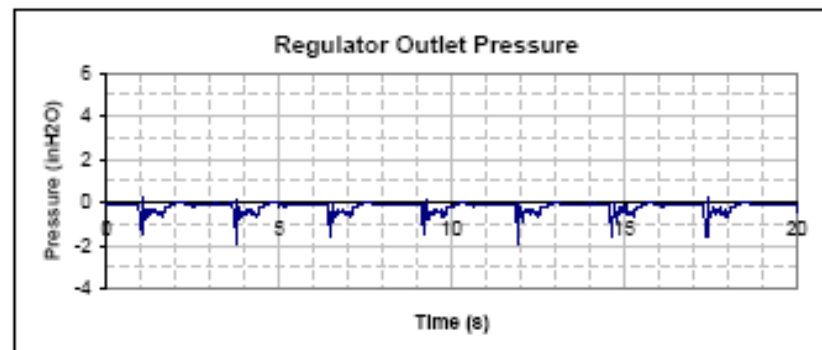
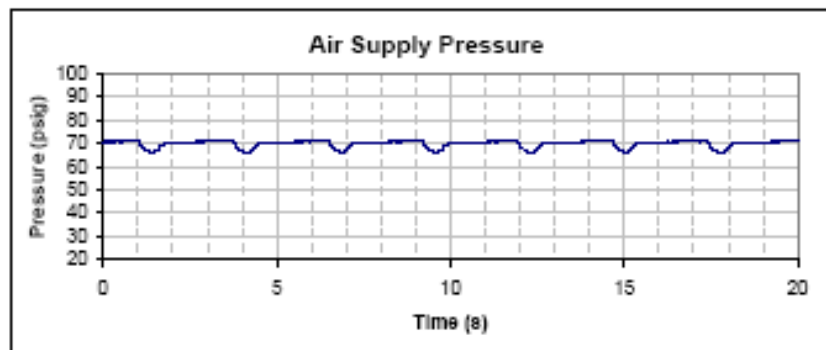
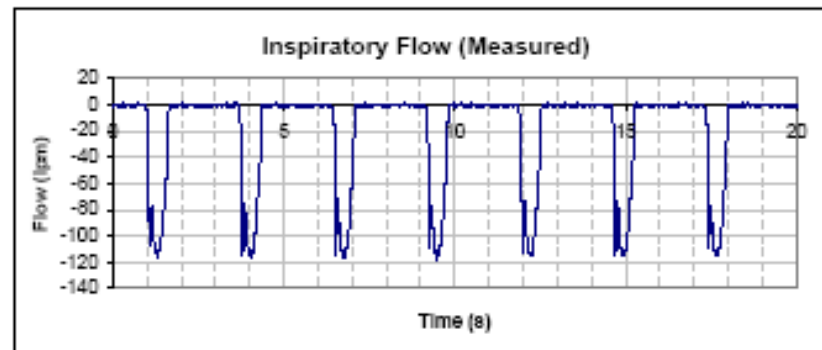
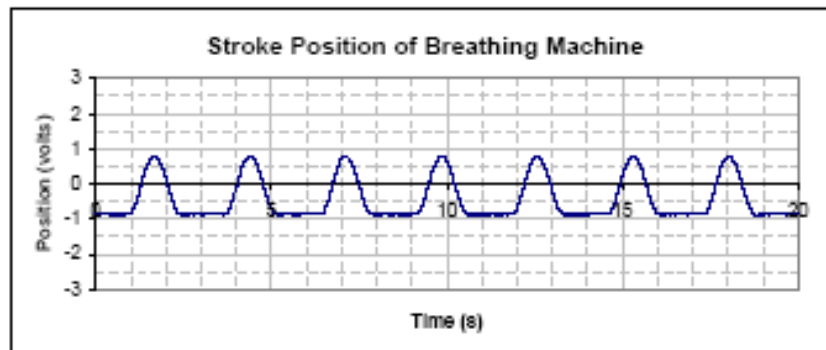
Group: 2 - Varied Inlet Pressure Settings

Test #: 3

Breathing Rate (bpm) 22  
Stroke Volume (l) 0.91

Minute Volume (l) 20  
Peak Inspired Flow (lpm) 120

Altitude GL  
Inlet Pressure (psig) 70  
Regulator Mode Dilution



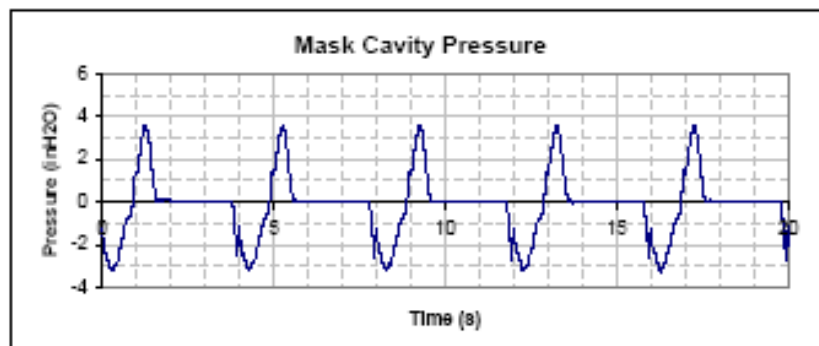
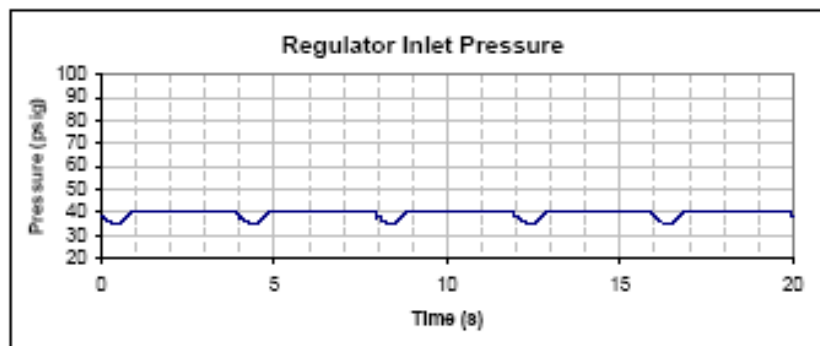
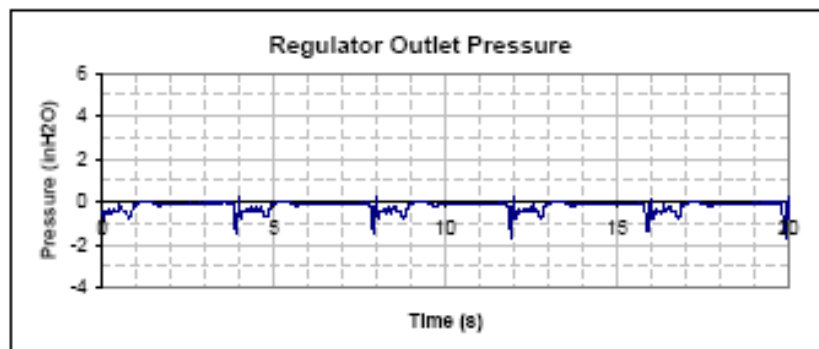
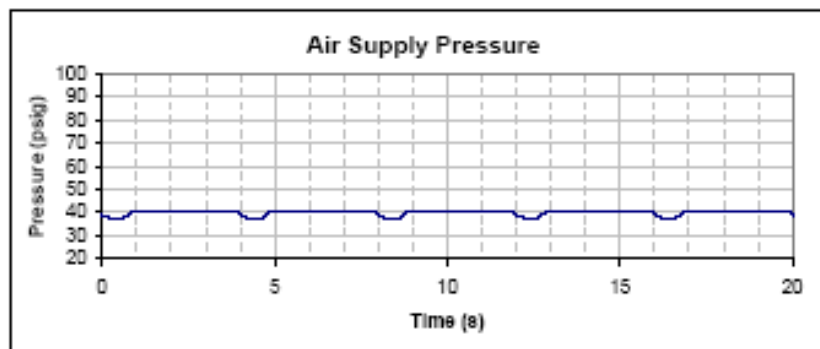
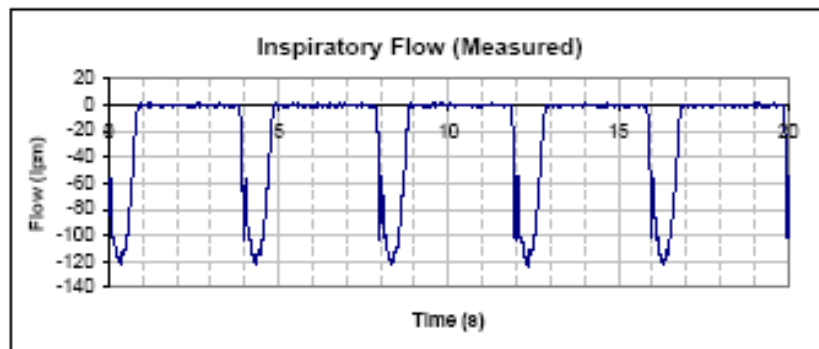
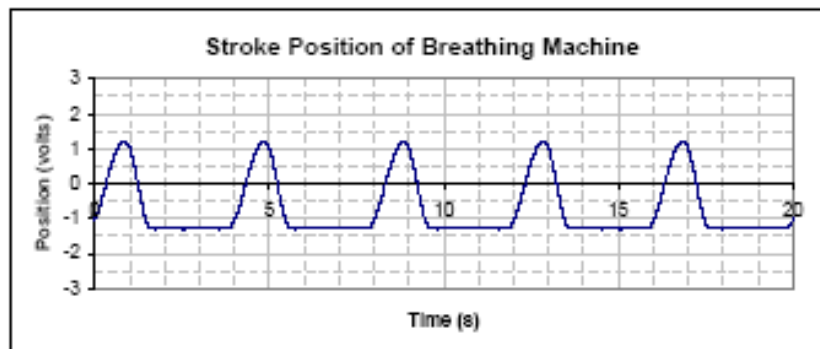
CF188 Oxygen System Compatability Test - NACES Configuration

Group: 2 - Varied Inlet Pressure Settings

Test #: 4  
Breathing Rate (bpm) 15  
Stroke Volume (l) 1.33

Minute Volume (l) 20  
Peak Inspired Flow (lpm) 120

Altitude GL  
Inlet Pressure (psig) 40  
Regulator Mode Dilution

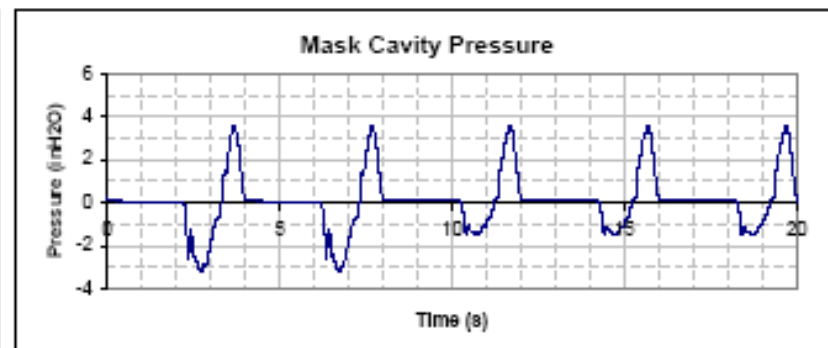
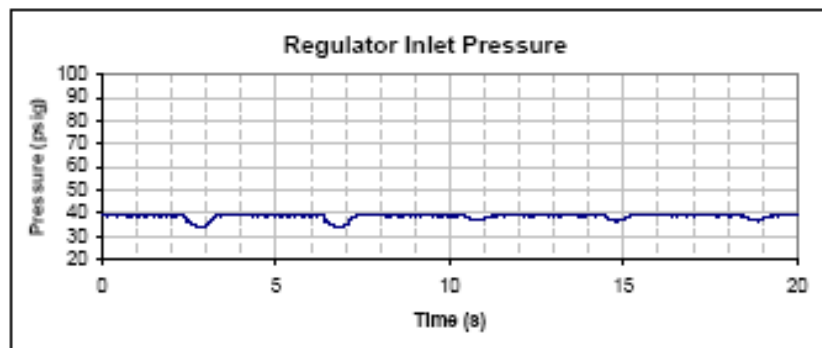
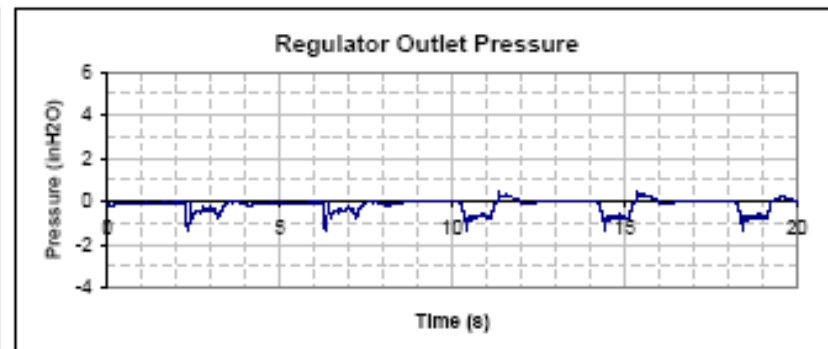
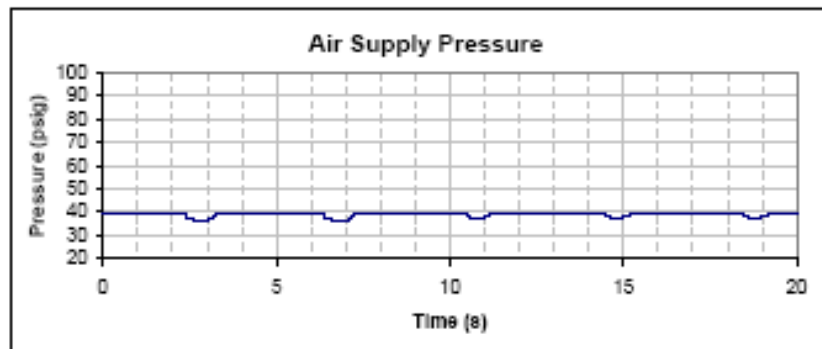
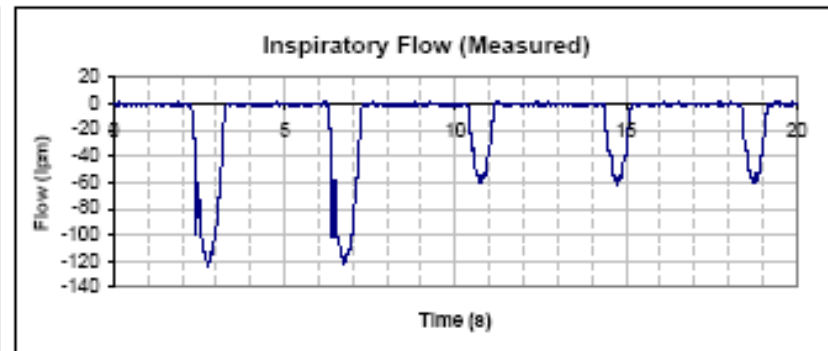
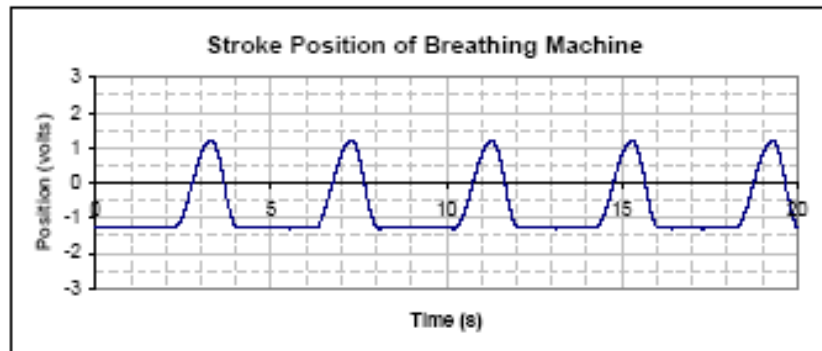


CF188 Oxygen System Compatability Test - NACES Configuration

Group: 2 - Varied Inlet Pressure Settings

Test #: 5  
Breathing Rate (bpm) 15  
Stroke Volume (l) 1.33

Altitude GL  
Minute Volume (l) 20  
Inlet Pressure (psig) 40  
Peak Inspired Flow (lpm) 120  
Regulator Mode Dilution



CF188 Oxygen System Compatibility Test - NACES Configuration

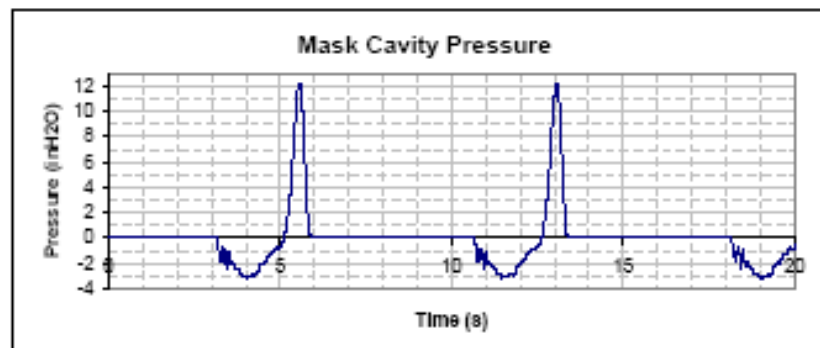
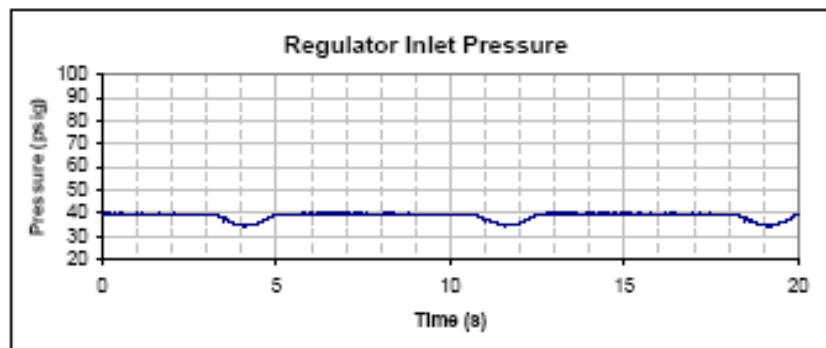
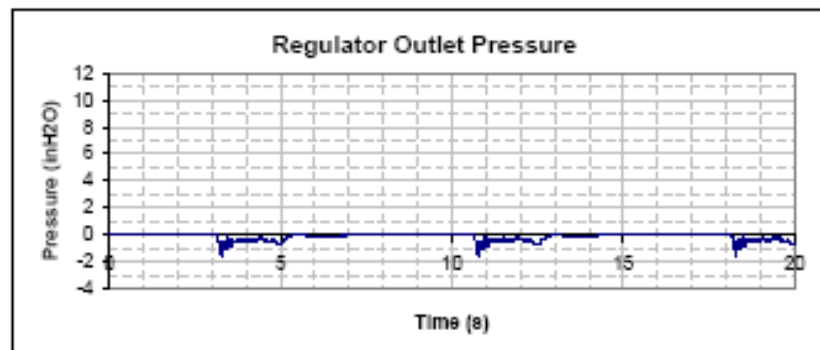
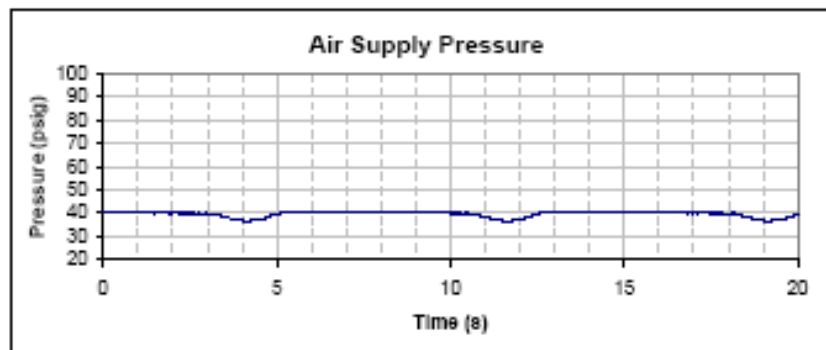
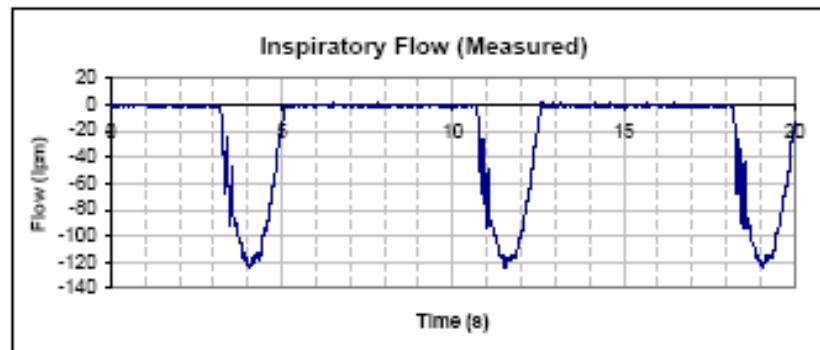
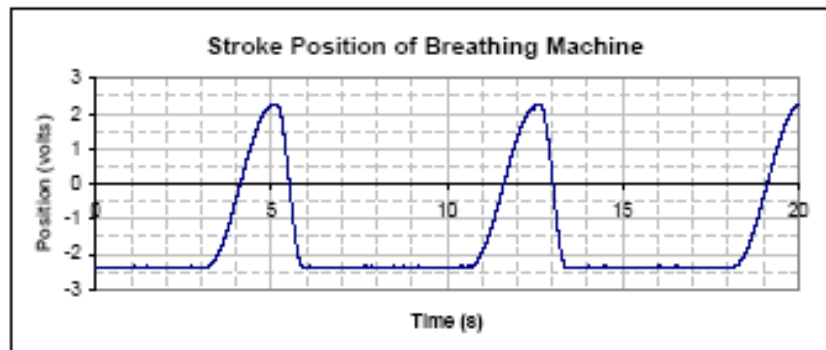
Group: 2 - Varied Inlet Pressure Settings

Test #: 8

Breathing Rate (bpm) 8  
Stroke Volume (l) 2.5

Minute Volume (l) 20  
Peak Inspired Flow (lpm) 120

Altitude GL  
Inlet Pressure (psig) 40  
Regulator Mode Dilution



CF188 Oxygen System Compatibility Test - NACES Configuration

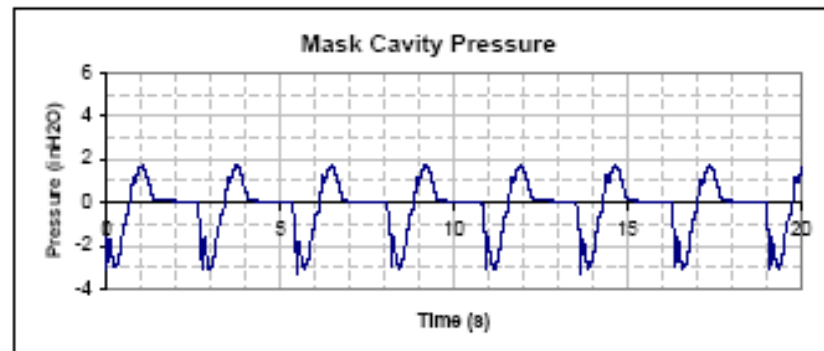
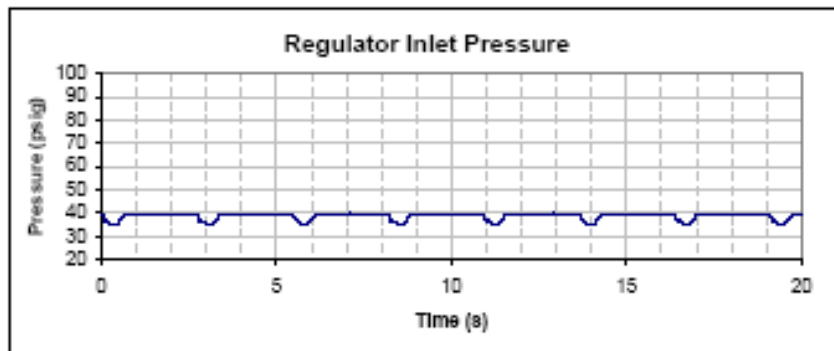
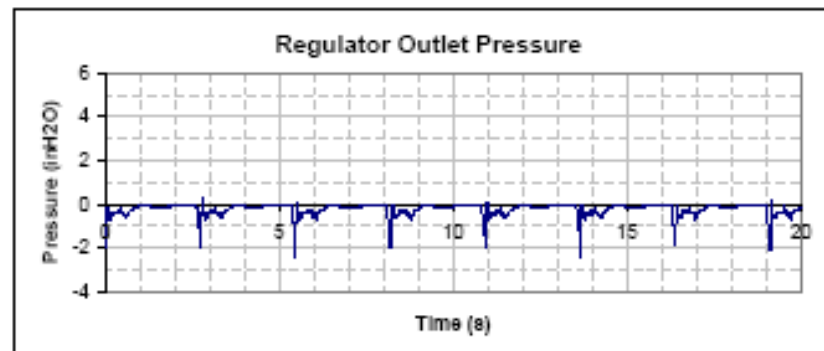
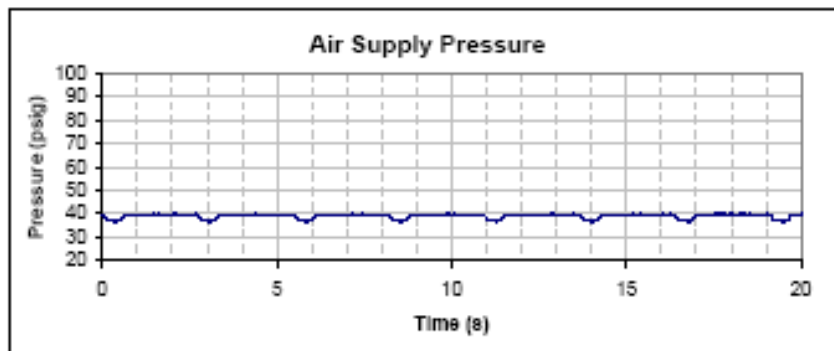
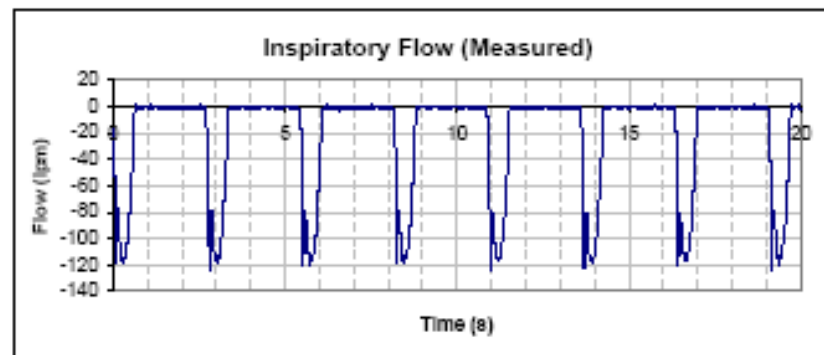
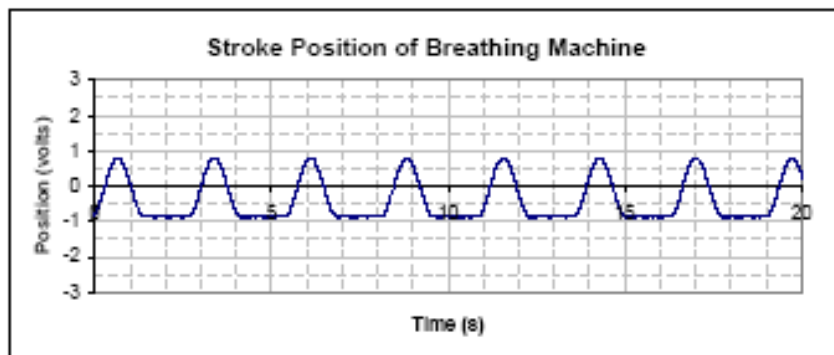
Group: 2 - Varied Inlet Pressure Settings

Test #: 7

Breathing Rate (bpm) 22  
Stroke Volume (l) 0.91

Minute Volume (l) 20  
Peak Inspired Flow (lpm) 120

Altitude GL  
Inlet Pressure (psig) 40  
Regulator Mode Dilution

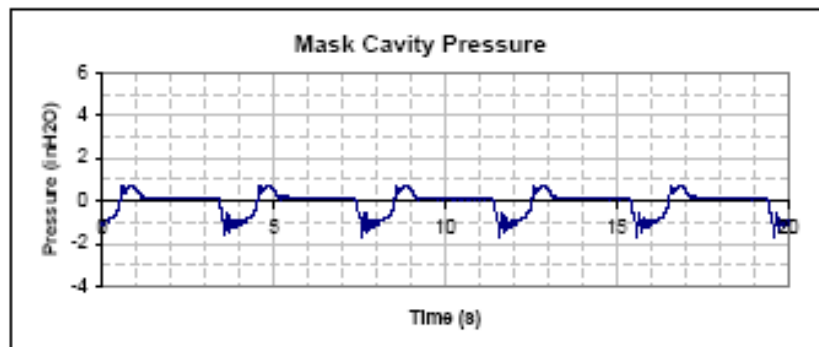
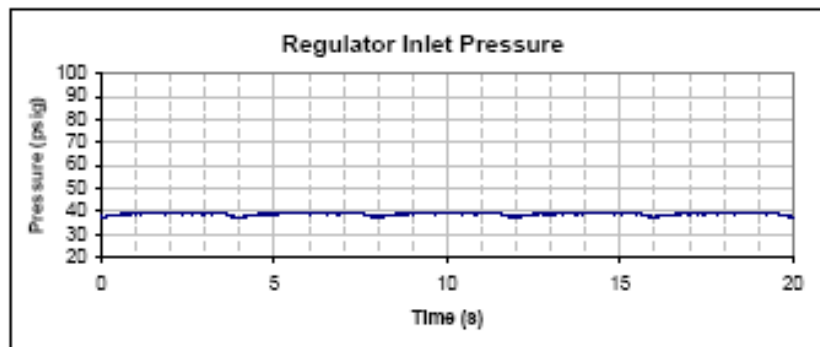
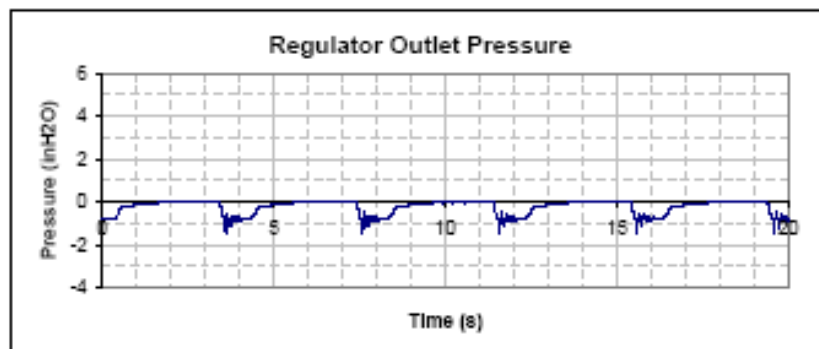
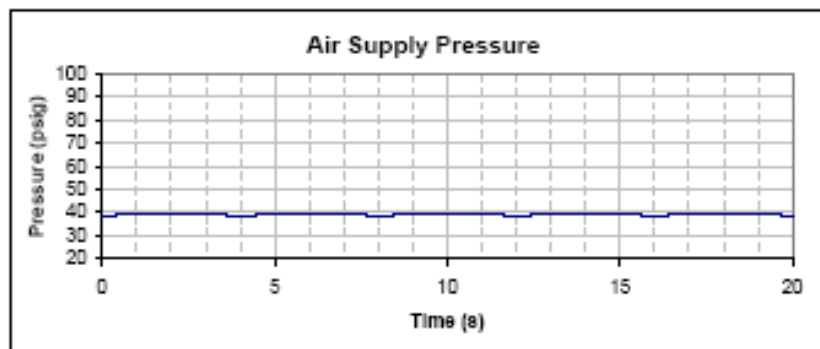
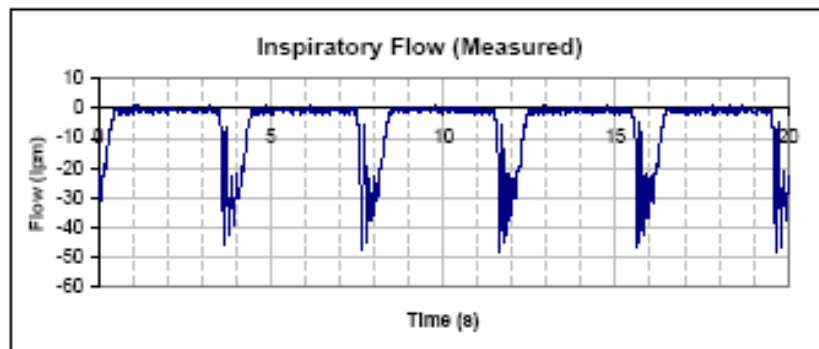
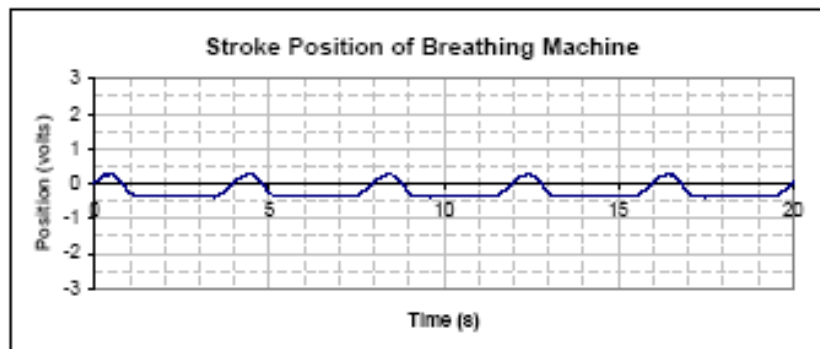


CF188 Oxygen System Compatability Test - NACES Configuration

Group: 2 - Varied Inlet Pressure Settings

Test #: 8  
Breathing Rate (bpm) 15  
Stroke Volume (l) 0.33

Minute Volume (l) 5  
Peak Inspired Flow (lpm) 30  
Altitude 40  
Inlet Pressure (psig) 40  
Regulator Mode Dilution

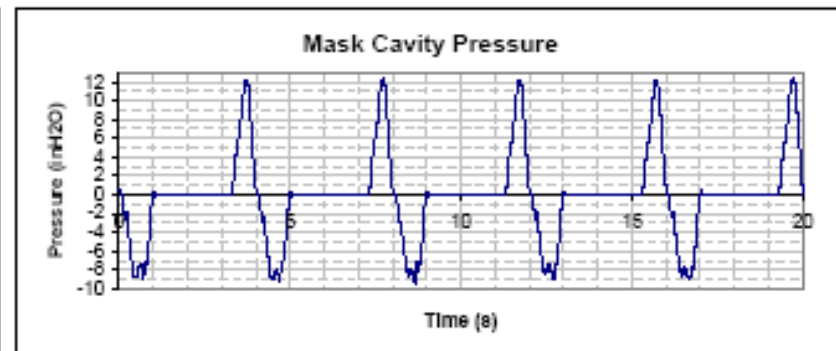
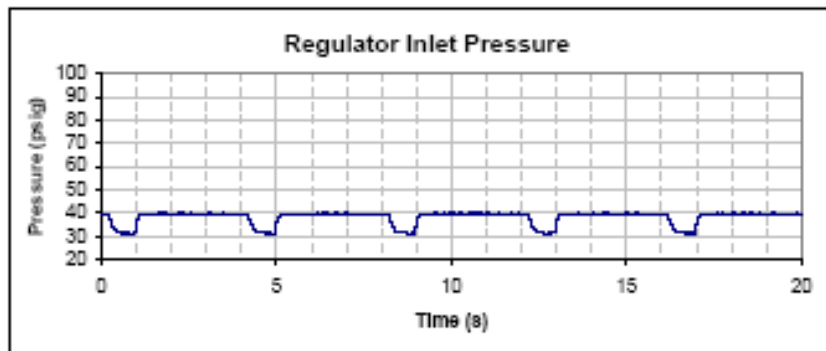
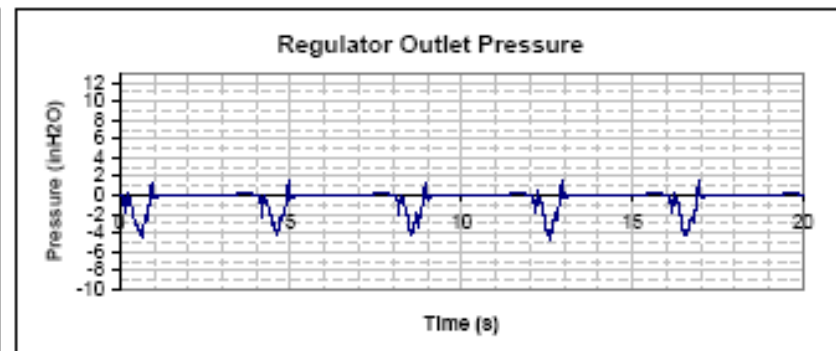
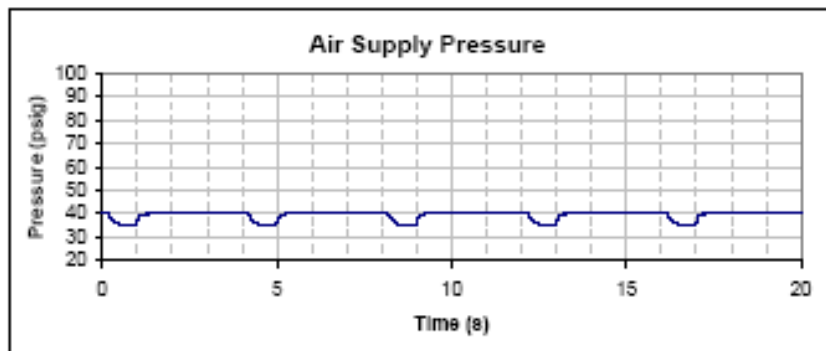
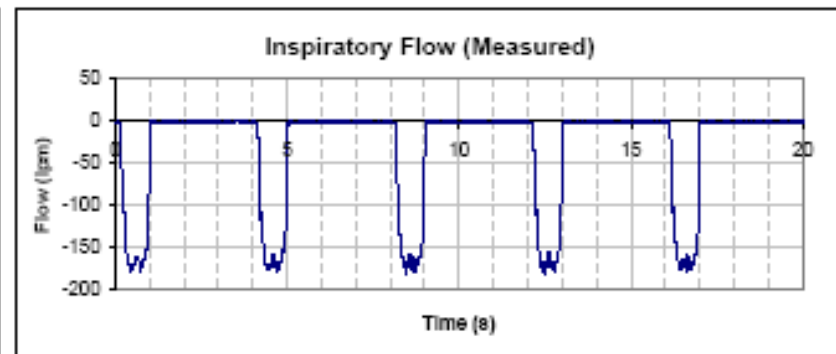
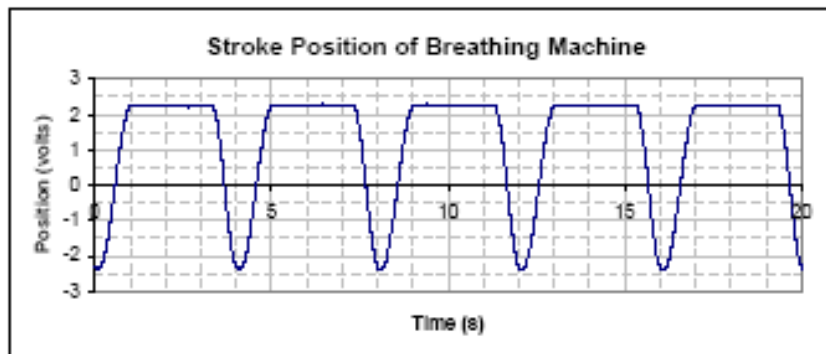


CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 2 - Varied Inlet Pressure Settings

Test #: 9  
Breathing Rate (bpm) 15  
Stroke Volume (l) 2.5

Altitude GL  
Minute Volume (l) 37.5  
Inlet Pressure (psig) 40  
Peak Inspired Flow (lpm) 250  
Regulator Mode Dilution



CF188 Oxygen System Compatibility Test - NACES Configuration

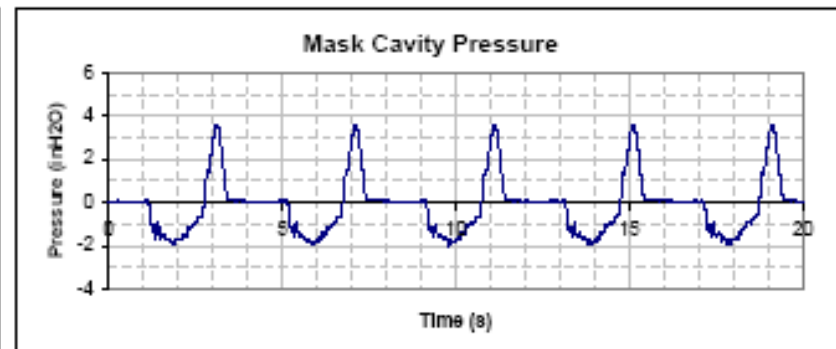
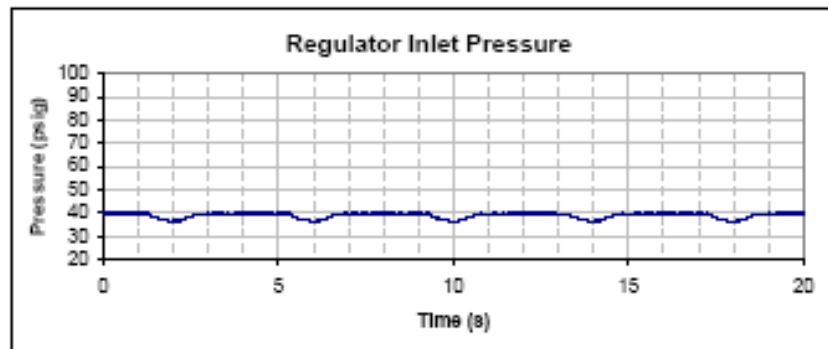
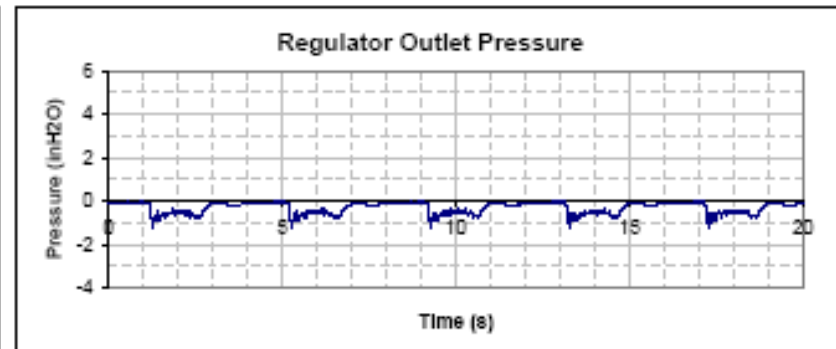
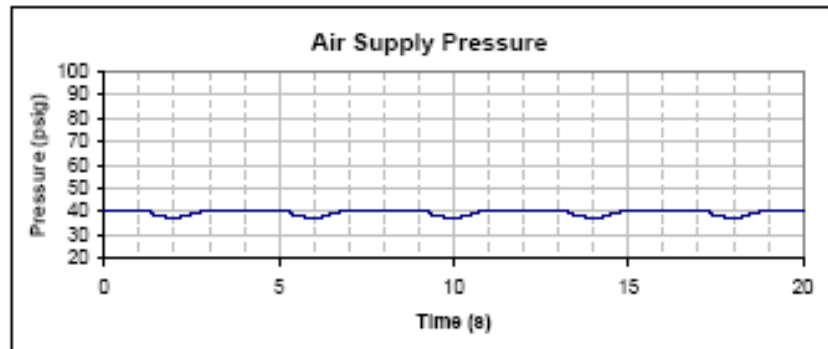
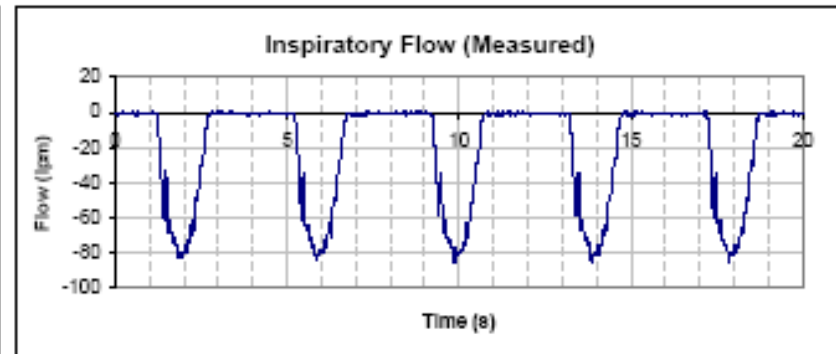
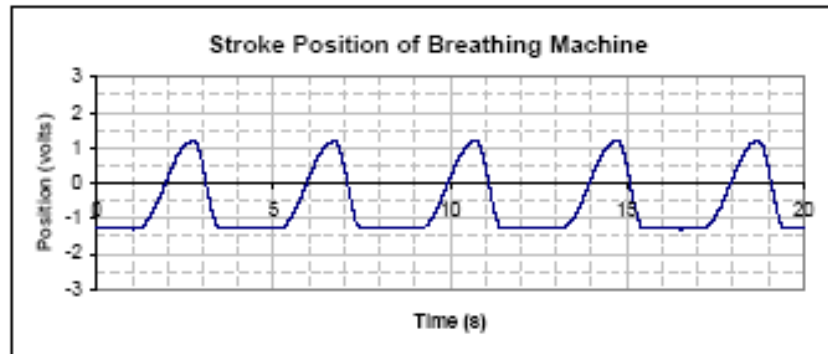
Group: 2 - Varied Inlet Pressure Settings

Test #: 10

Breathing Rate (bpm) 15  
Stroke Volume (l) 1.33

Minute Volume (l) 20  
Peak Inspired Flow (lpm) 80

Altitude GL  
Inlet Pressure (psig) 40  
Regulator Mode Dilution





CF188 Oxygen System Compatibility Test - NACES Configuration

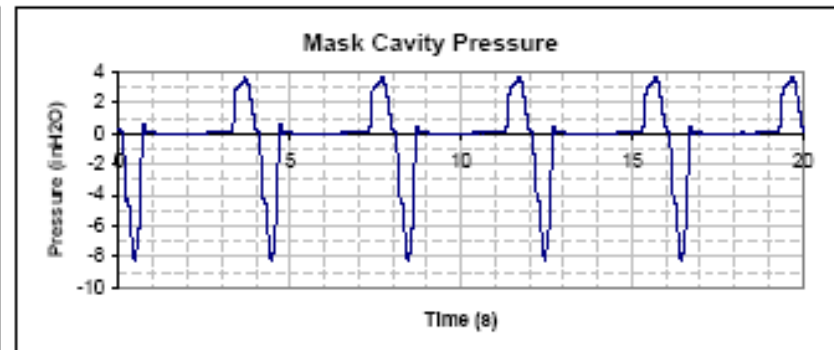
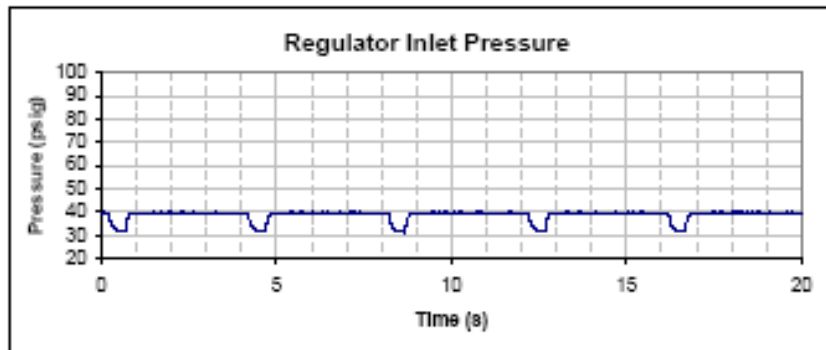
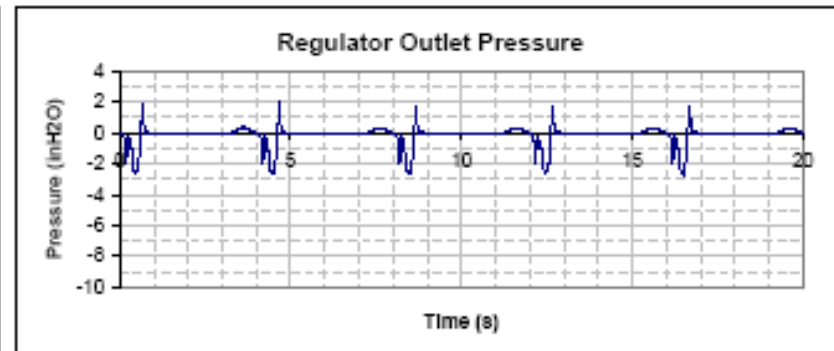
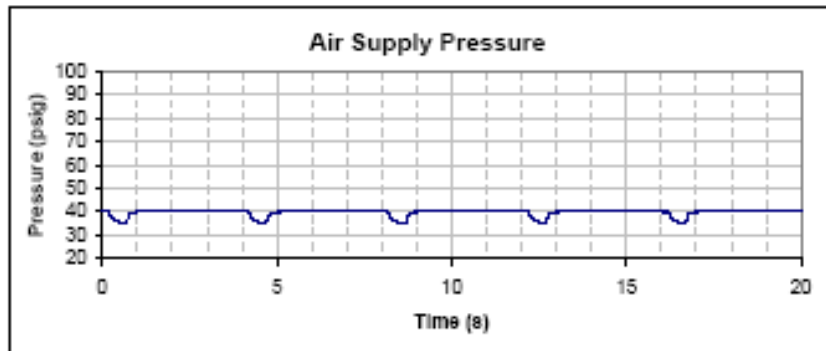
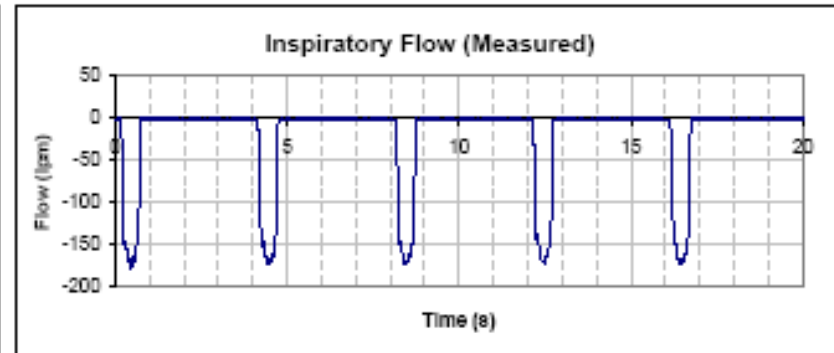
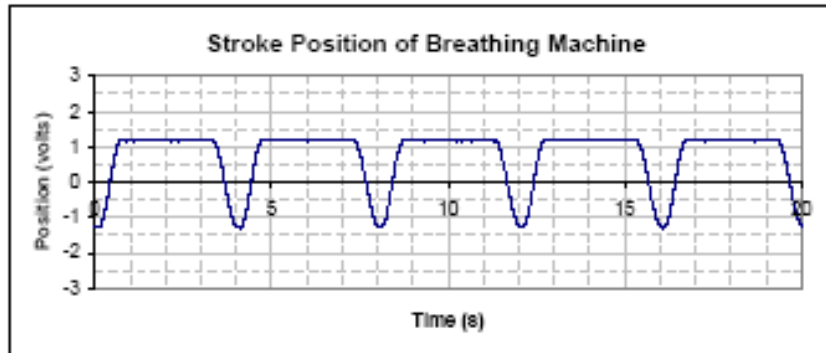
Group: 2 - Varied Inlet Pressure Settings

Test #: 11

Breathing Rate (bpm) 15  
Stroke Volume (l) 1.33

Minute Volume (l) 20  
Peak Inspired Flow (lpm) 200

Altitude GL  
Inlet Pressure (psig) 40  
Regulator Mode normal



CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 2 - Varied Inlet Pressure Settings

Test #: 12

Breathing Rate (bpm)

15

Stroke Volume (l)

1.33

Minute Volume (l)

20

Peak Inspired Flow (lpm)

120

Altitude

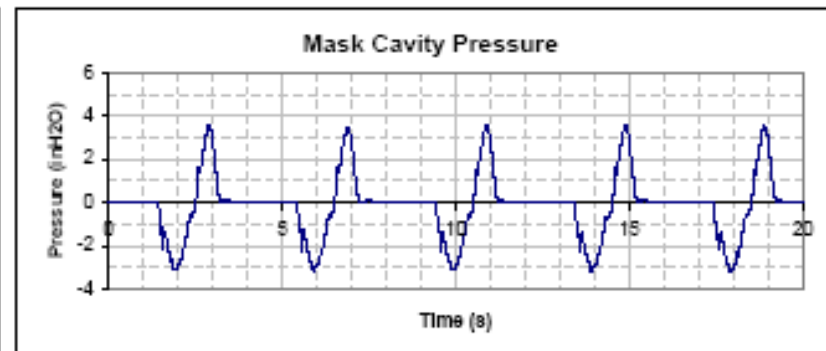
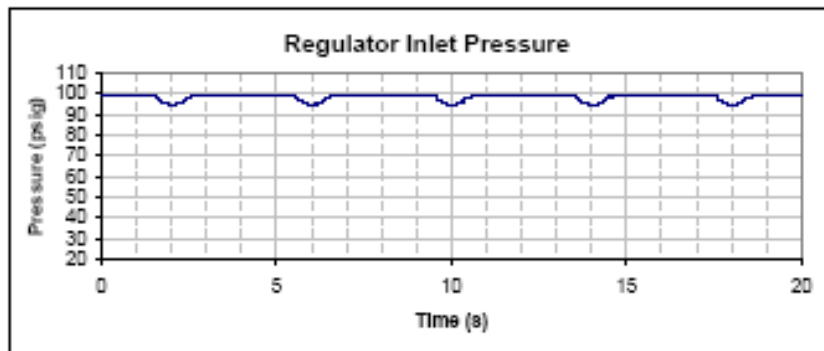
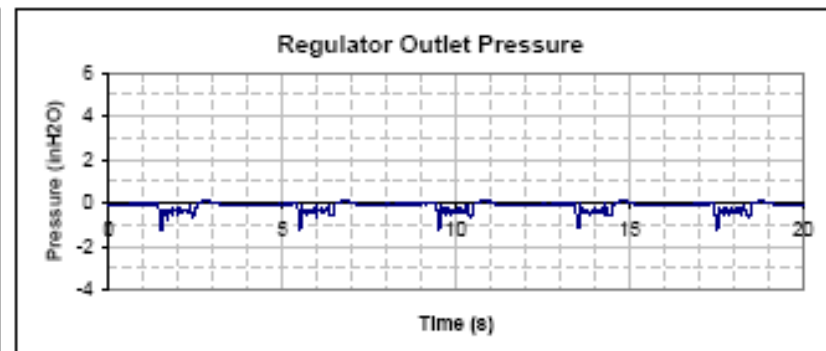
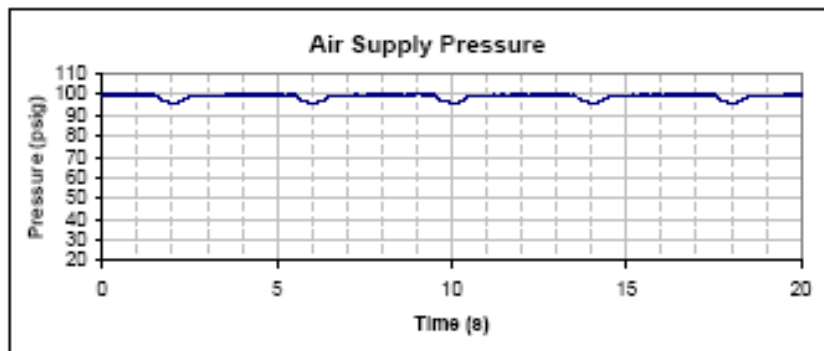
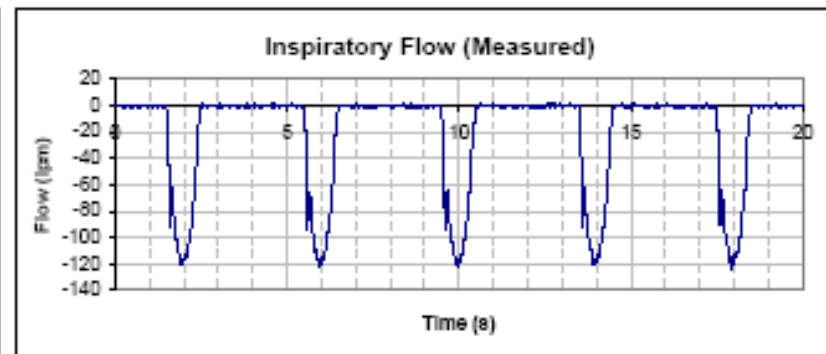
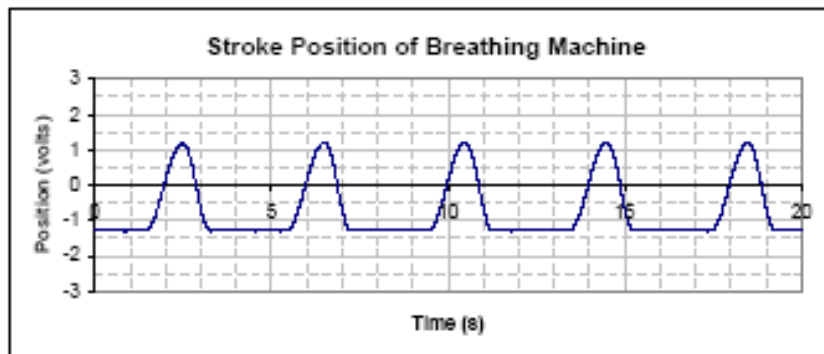
GL

Inlet Pressure (psig)

100

Regulator Mode

Dilution

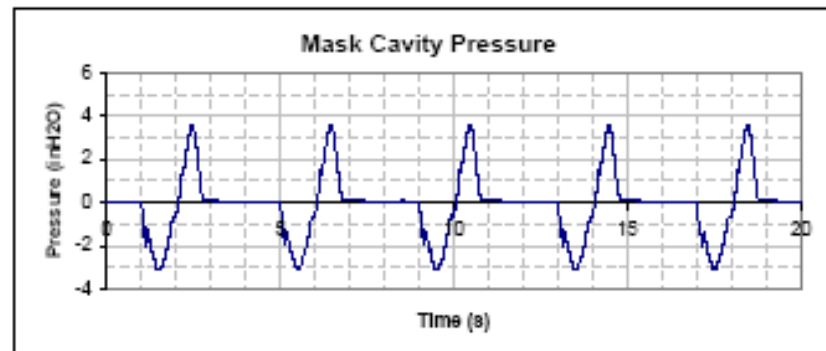
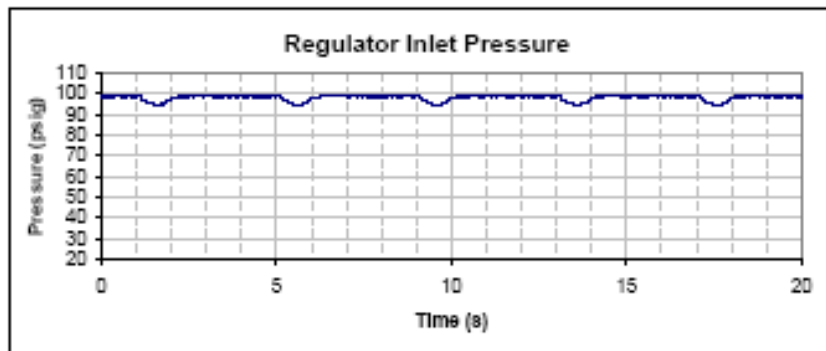
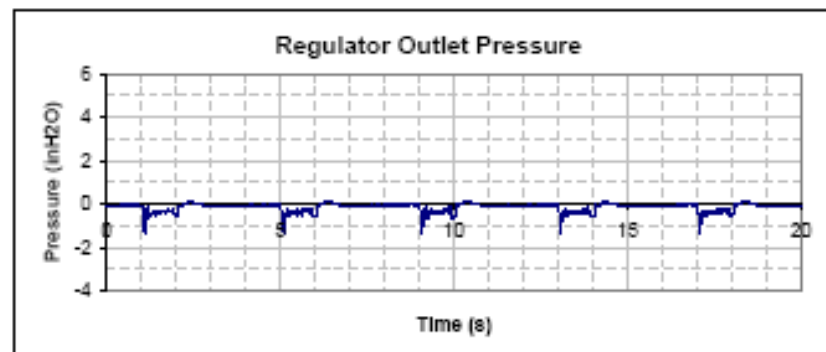
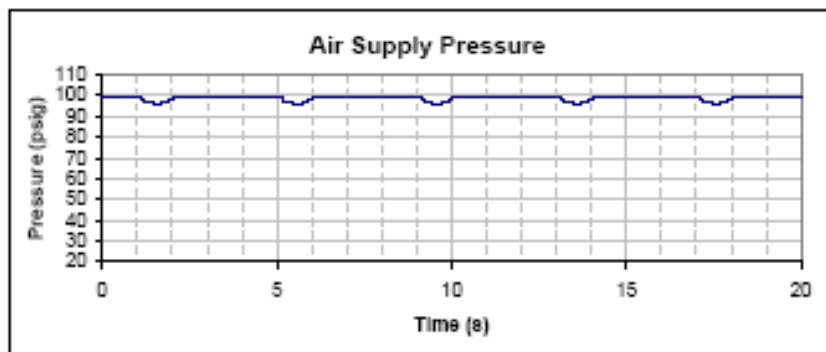
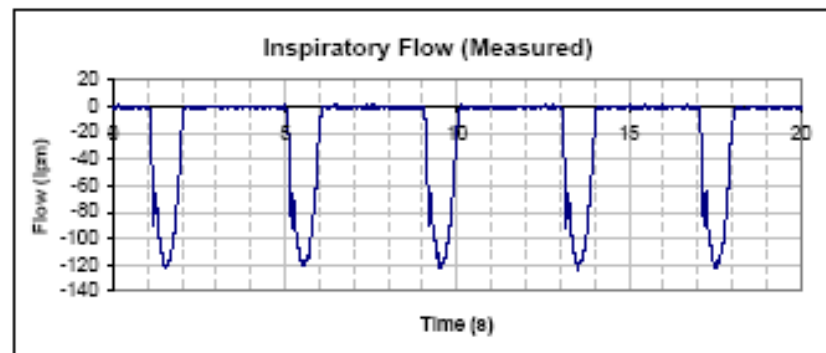
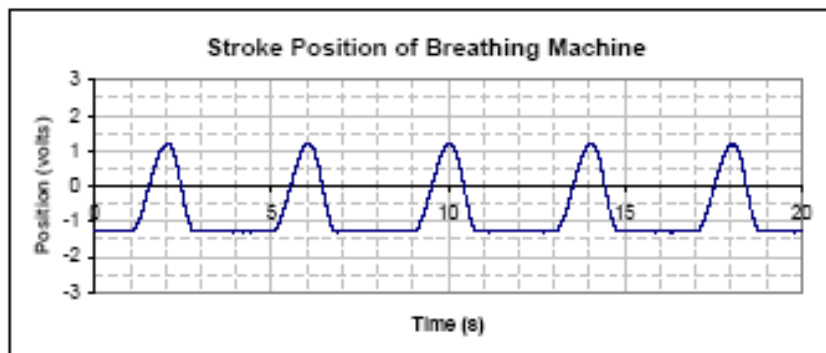


CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 2 - Varied Inlet Pressure Settings

Test #: 13  
Breathing Rate (bpm) 15  
Stroke Volume (l) 1.33

Altitude GL  
Minute Volume (l) 20  
Inlet Pressure (psig) 100  
Peak Inspired Flow (lpm) 120  
Regulator Mode Dilution



CF188 Oxygen System Compatibility Test - NACES Configuration

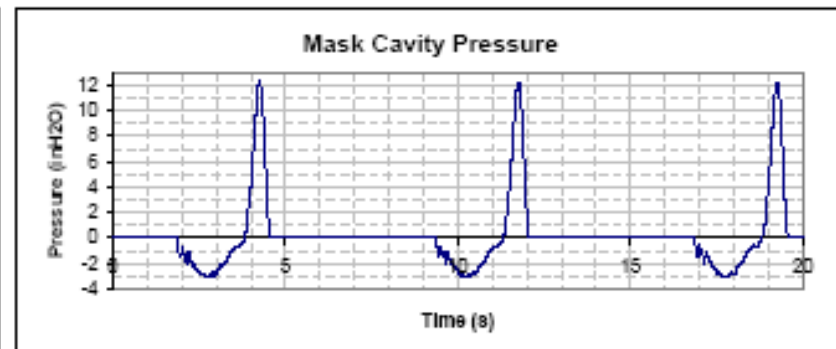
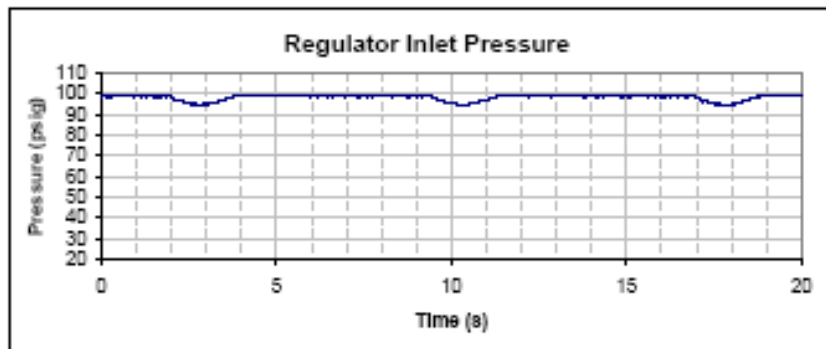
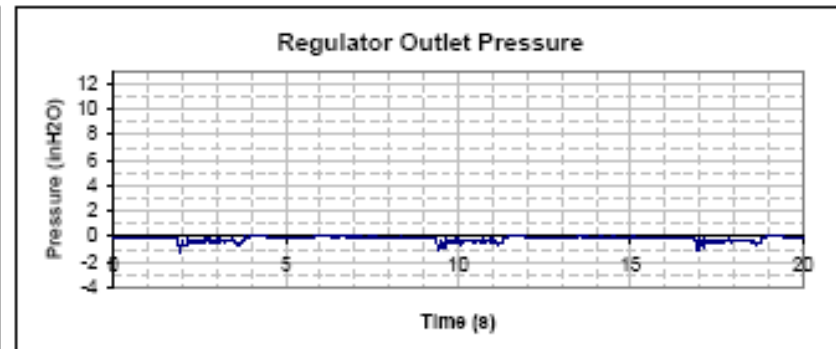
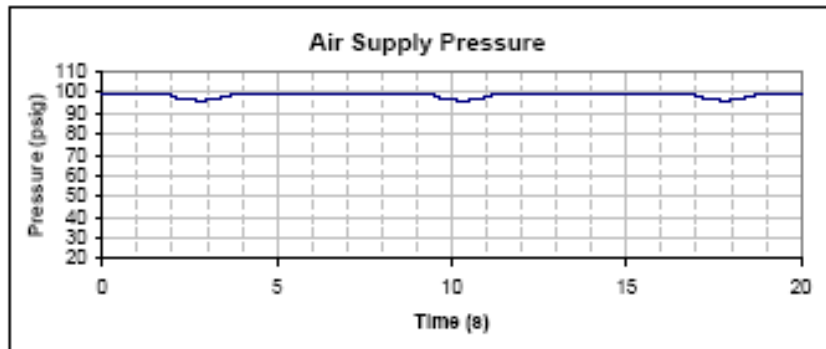
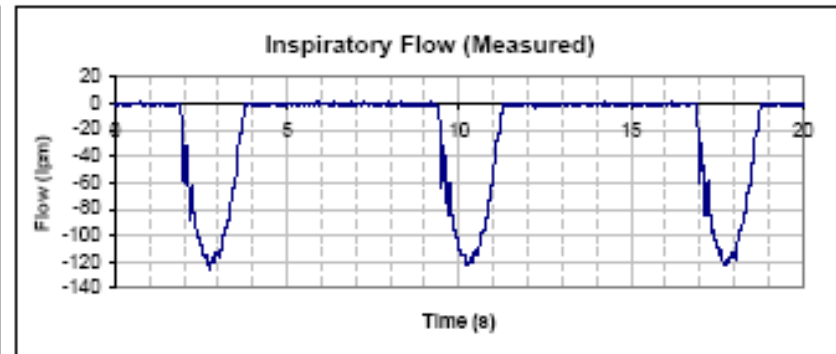
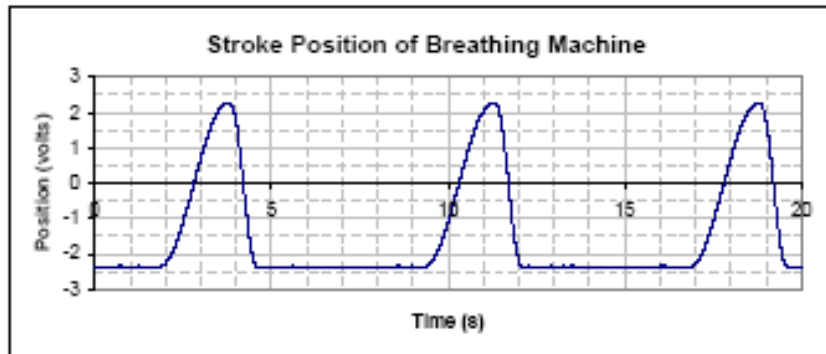
Group: 2 - Varied Inlet Pressure Settings

Test #: 14

Breathing Rate (bpm) 8  
Stroke Volume (l) 2.5

Minute Volume (l) 20  
Peak Inspired Flow (lpm) 120

Altitude GL  
Inlet Pressure (psig) 100  
Regulator Mode Dilution

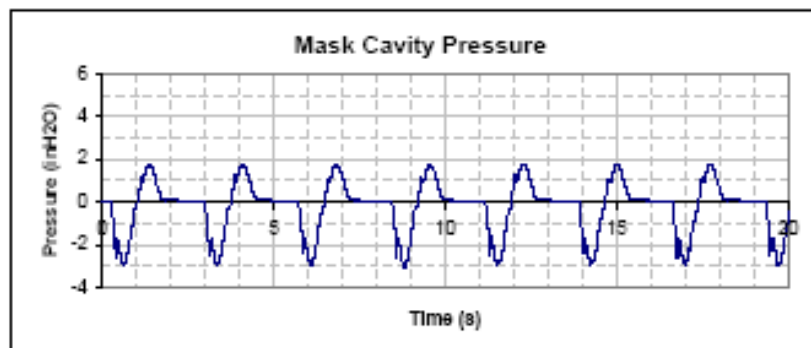
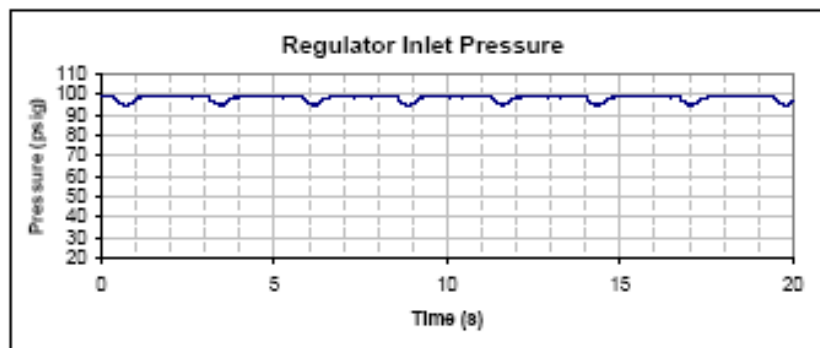
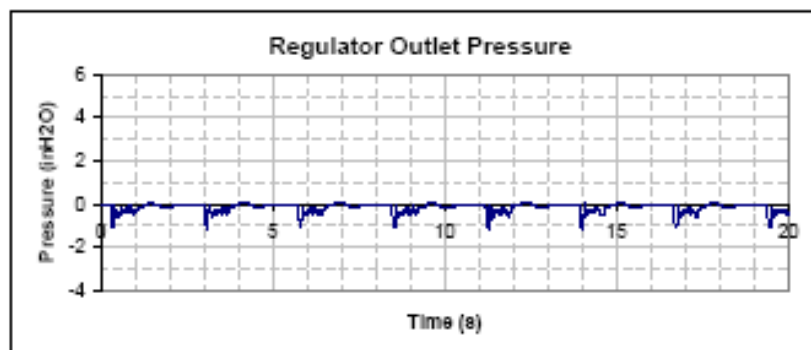
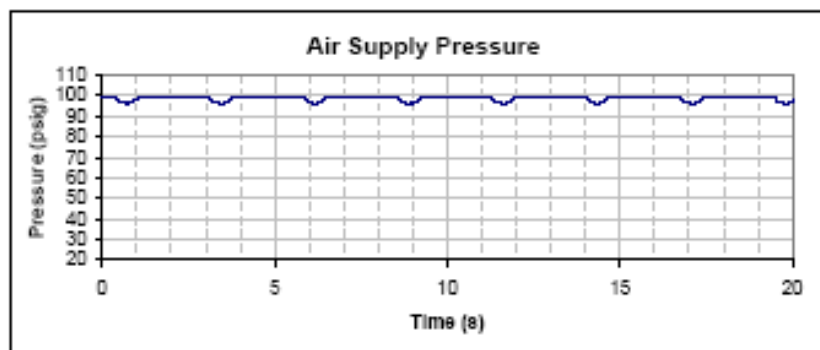
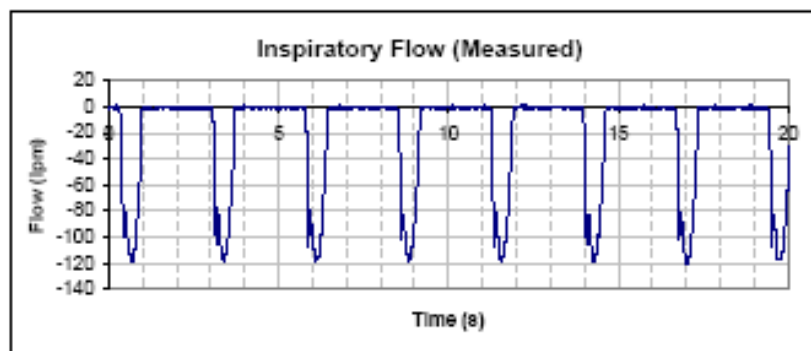
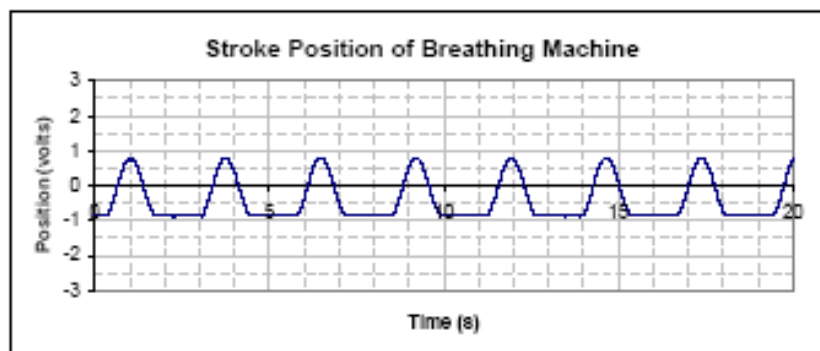


CF188 Oxygen System Compatability Test - NACES Configuration

Group: 2 - Varied Inlet Pressure Settings

Test #: 15 Breathing Rate (bpm) 22  
Stroke Volume (l) 0.91

Minute Volume (l) 20 Altitude  
Peak Inspired Flow (lpm) 120 Inlet Pressure (psig) 100  
Regulator Mode Dilution

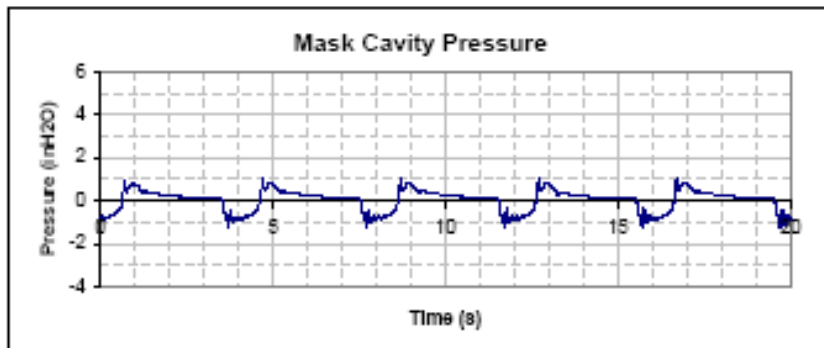
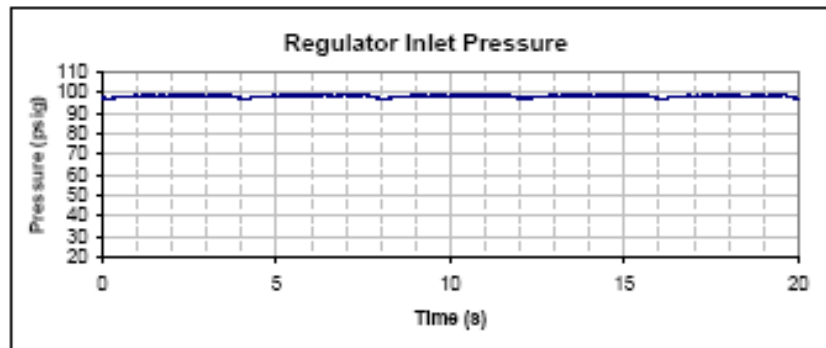
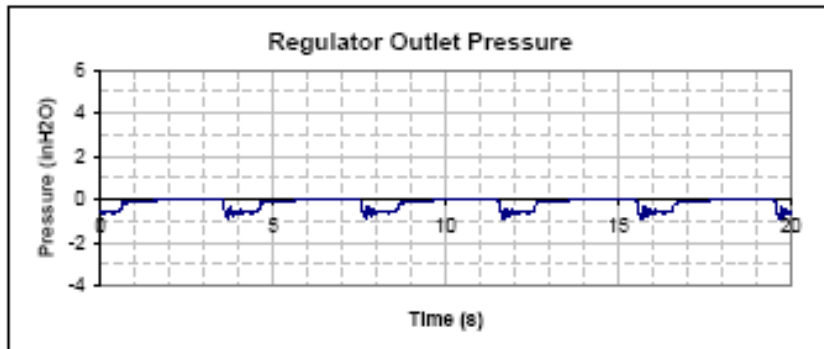
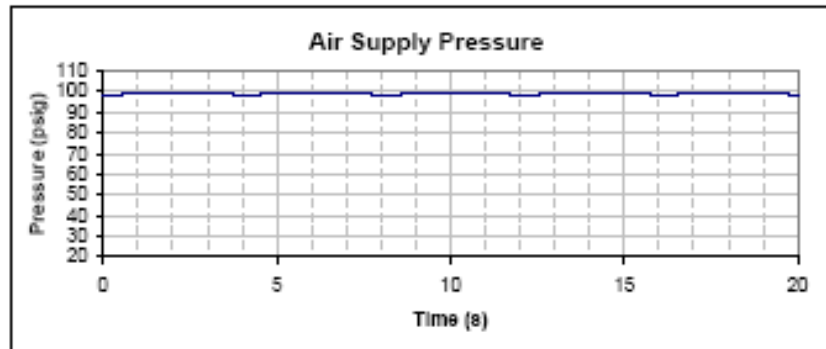
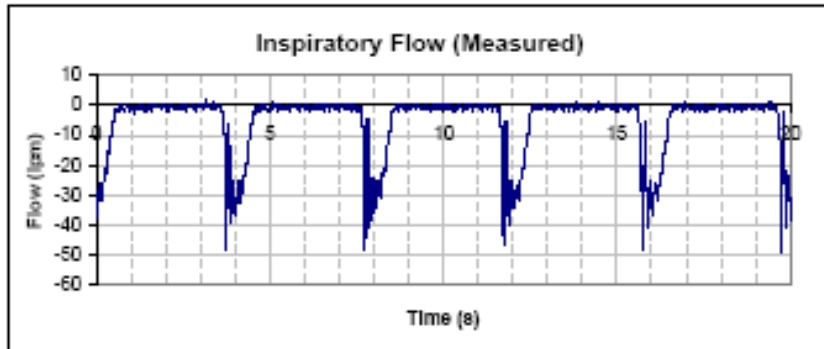
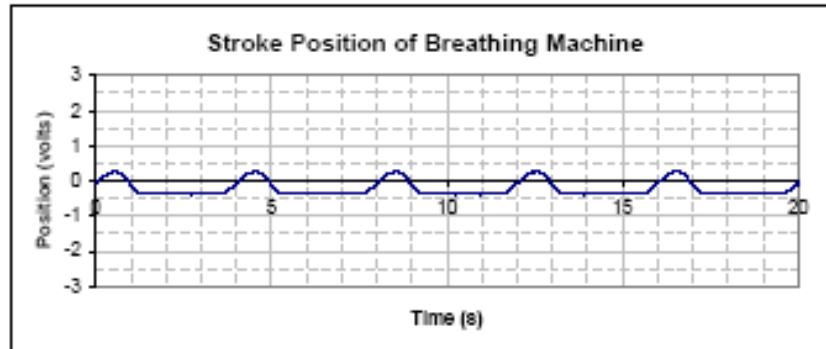


CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 2 - Varied Inlet Pressure Settings

Test #: 16  
Breathing Rate (bpm) 15  
Stroke Volume (l) 0.33

Altitude GL  
Inlet Pressure (psig) 100  
Regulator Mode Dilution  
Minute Volume (l) 5  
Peak Inspired Flow (lpm) 30



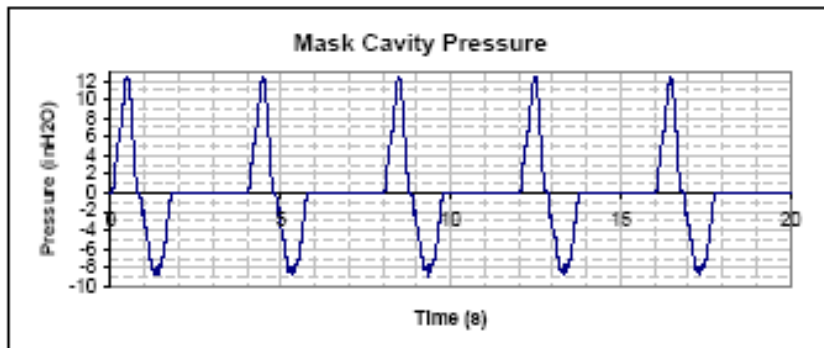
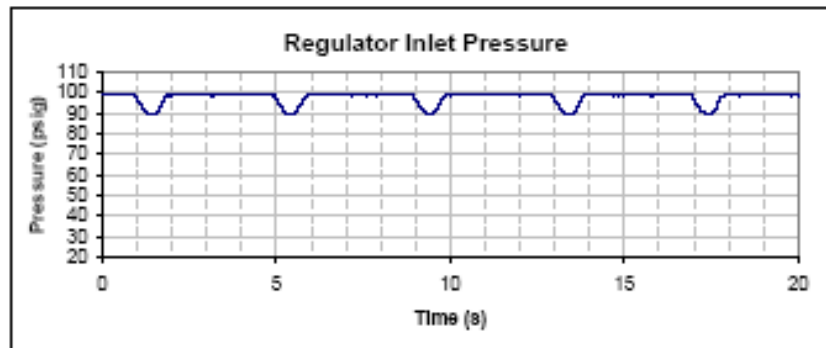
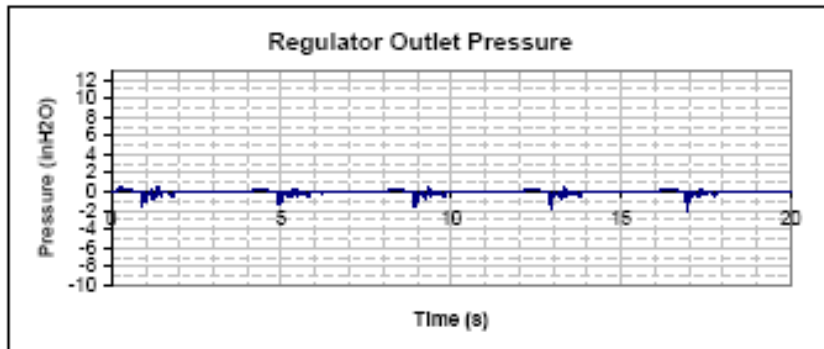
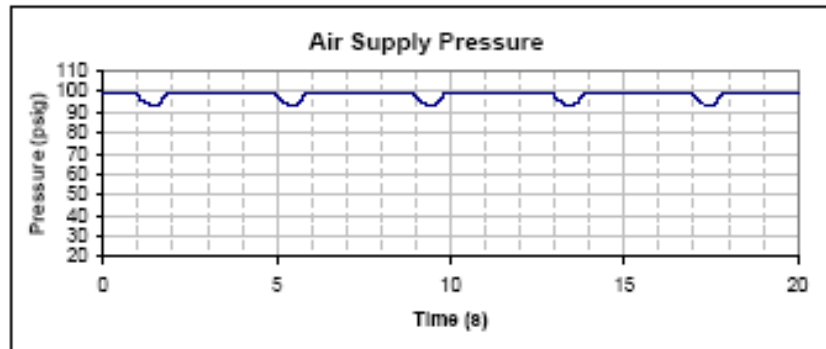
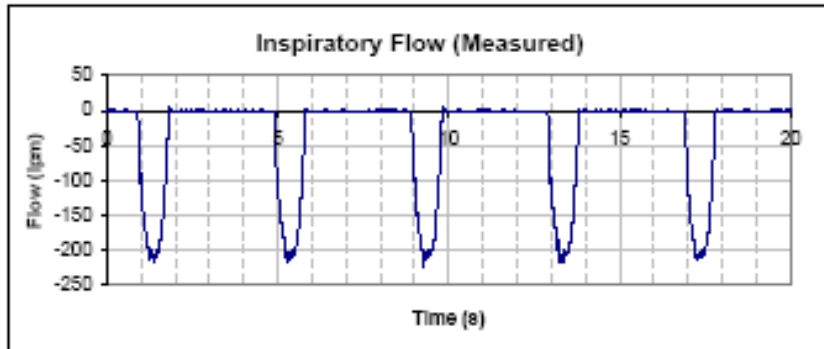
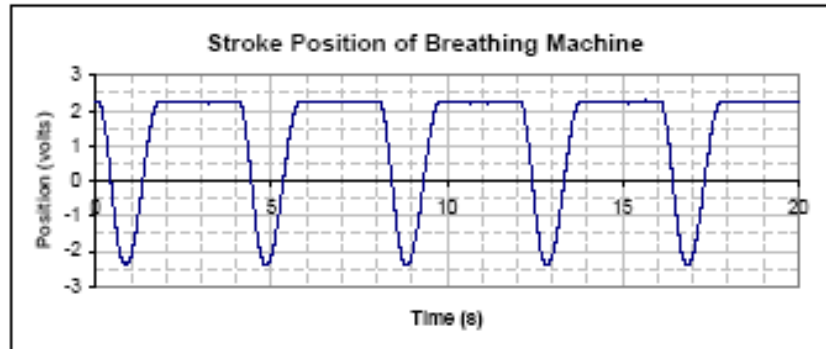
CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 2 - Varied Inlet Pressure Settings

Test #: 17 Breathing Rate (bpm) 15  
Stroke Volume (l) 2.5

Minute Volume (l) 37.5  
Peak Inspired Flow (lpm) 250

Altitude GL  
Inlet Pressure (psig) 100  
Regulator Mode Dilution

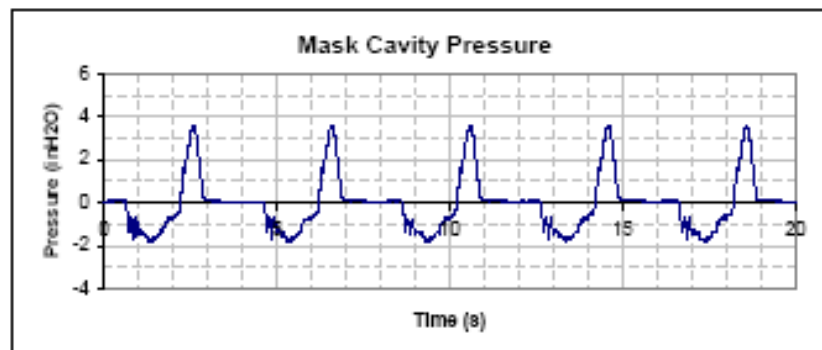
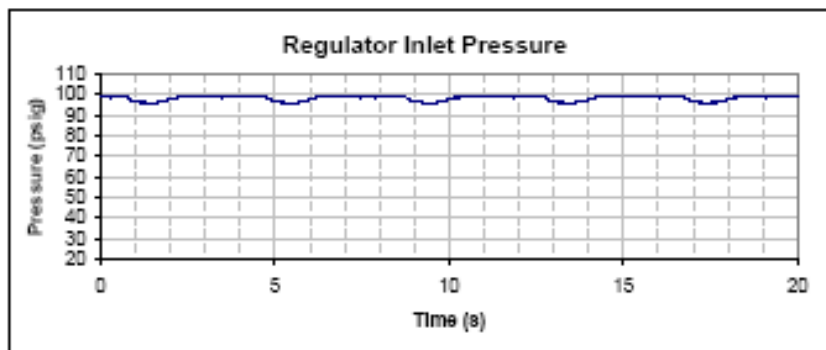
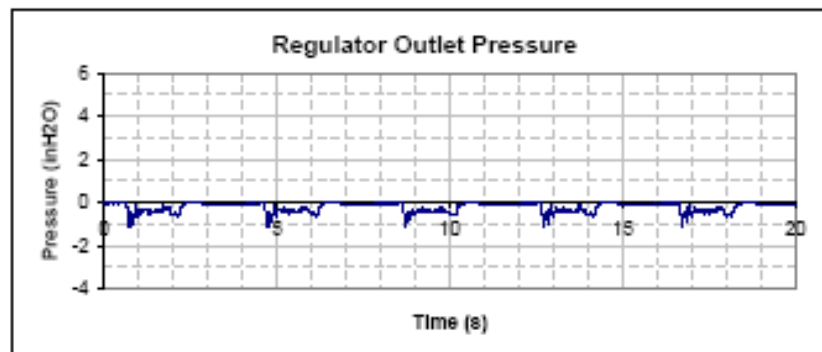
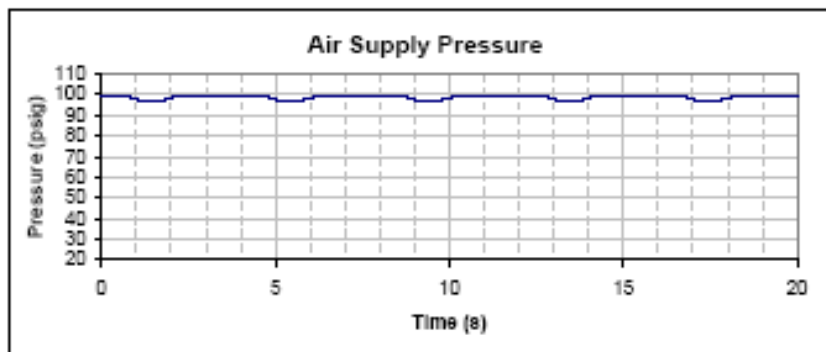
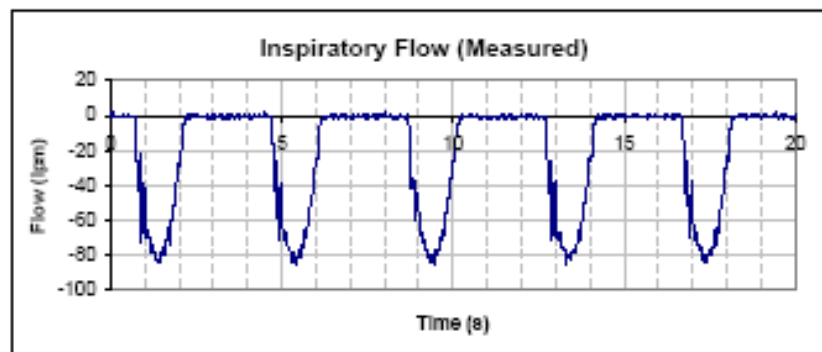
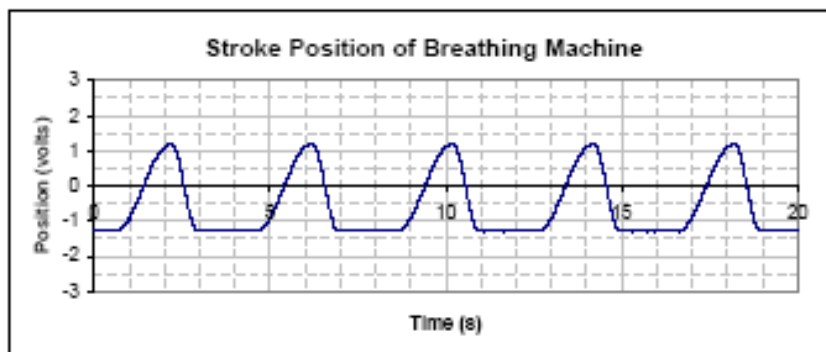


CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 2 - Varied Inlet Pressure Settings

Test #: 18  
Breathing Rate (bpm) 15  
Stroke Volume (l) 1.33

Altitude GL  
Minute Volume (l) 20  
Inlet Pressure (psig) 100  
Peak Inspired Flow (lpm) 80  
Regulator Mode Dilution





CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 2 - Varied Inlet Pressure Settings

Test #: 19

Breathing Rate (bpm)

15

Stroke Volume (l)

1.33

Minute Volume (l)

20

Peak Inspired Flow (lpm)

200

Altitude

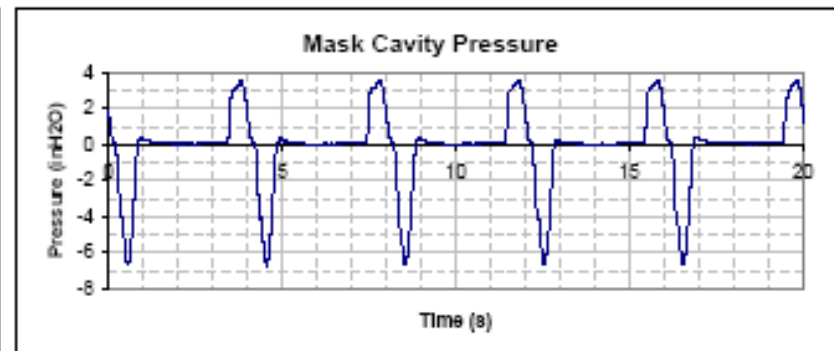
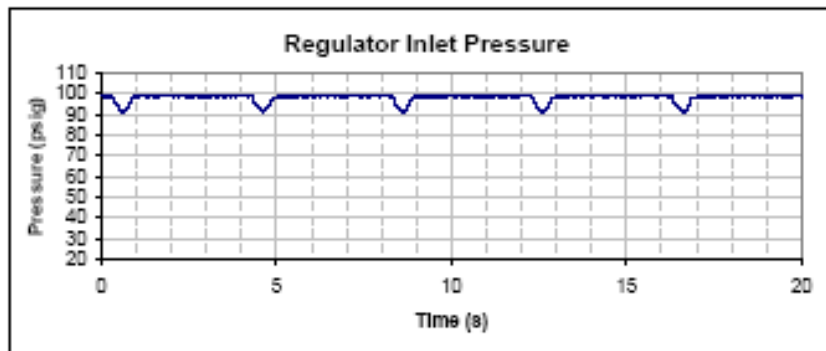
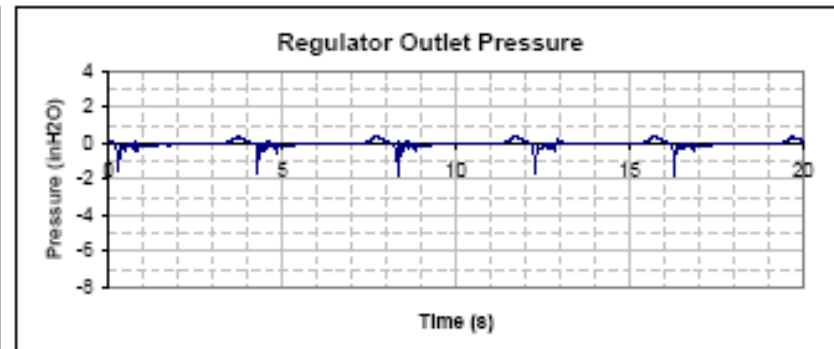
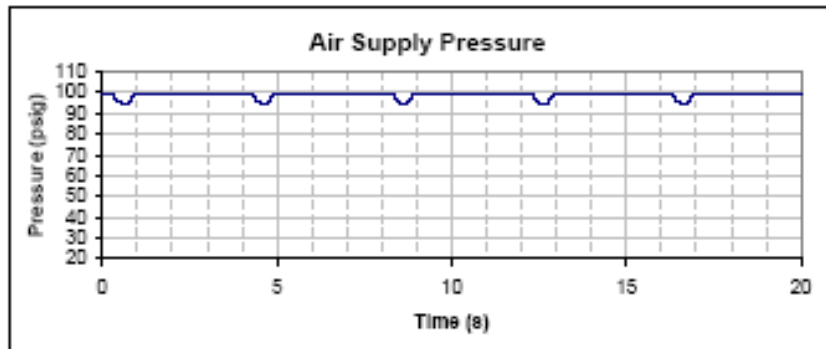
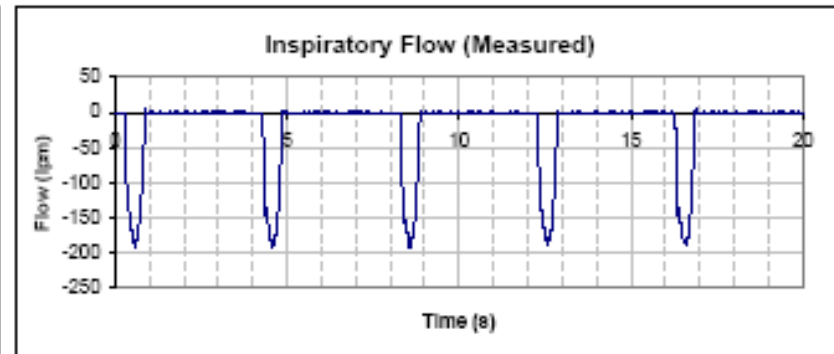
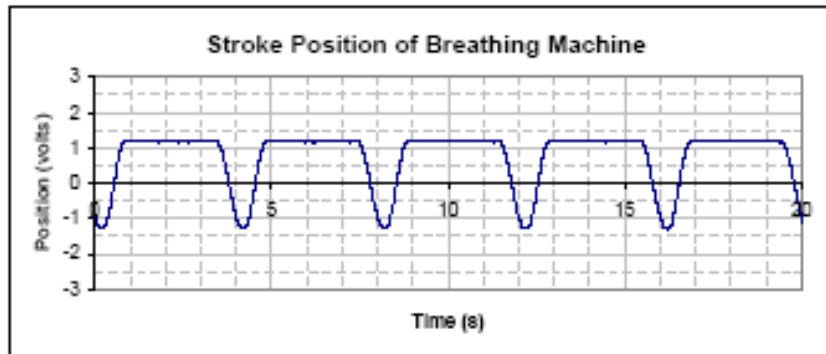
GL

Inlet Pressure (psig)

100

Regulator Mode

Dilution



CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 3 - Varied Mode

Settings

Test #: 20

Breathing Rate (bpm)

15

Stroke Volume (l)

1.33

Minute Volume (l)

20

Peak Inspired Flow (lpm)

120

Altitude

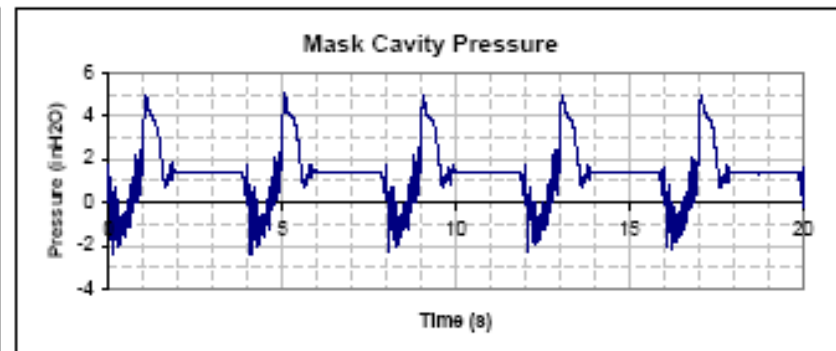
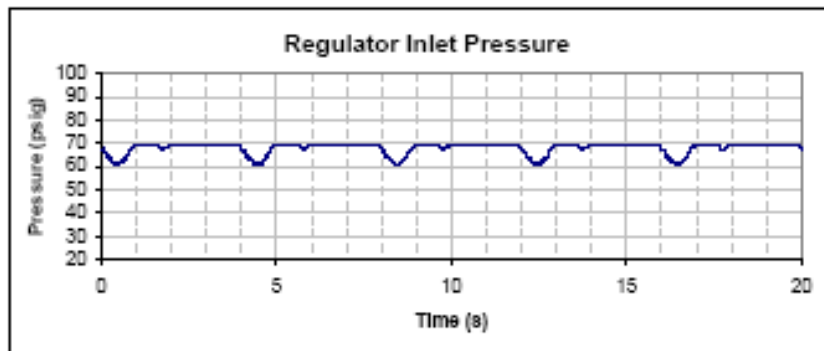
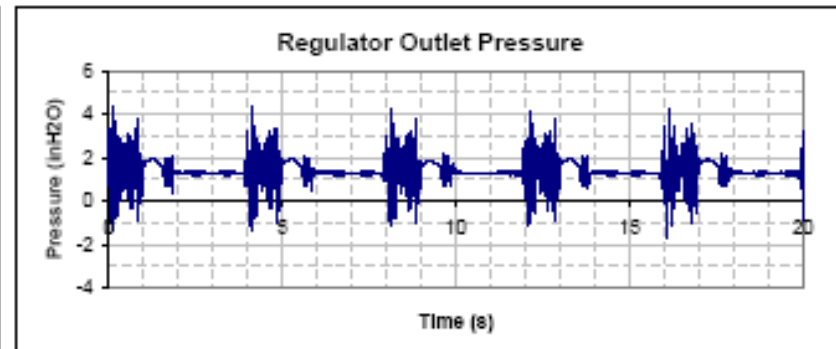
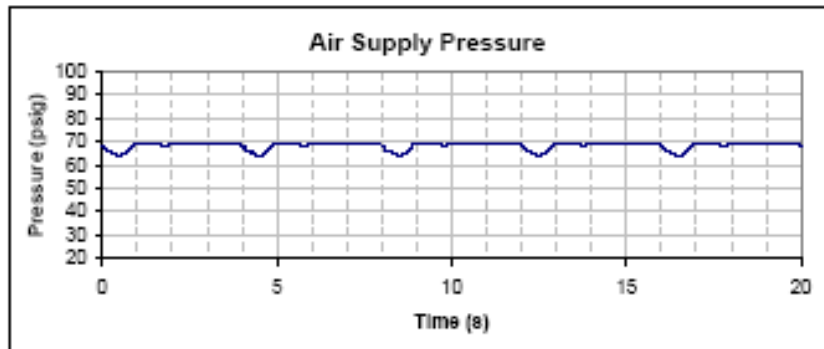
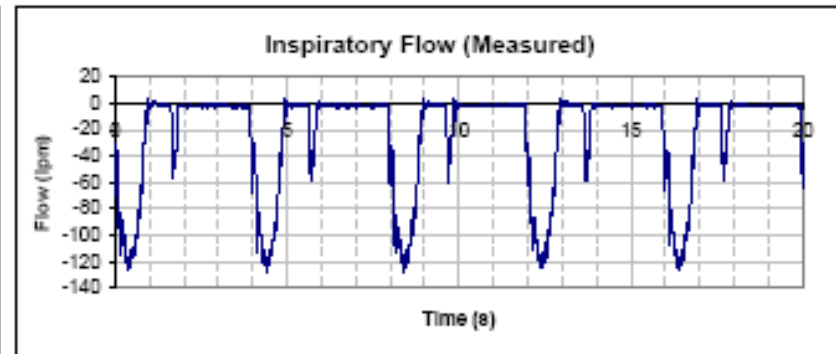
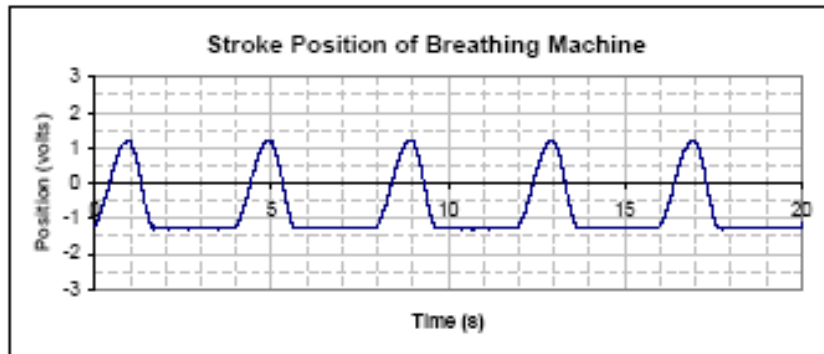
GL

Inlet Pressure (psig)

70

Regulator Mode

100%



CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 3 - Varied Mode

Settings

Test #: 21

Breathing Rate (bpm) 8

Stroke Volume (l) 2.5

Minute Volume (l) 20

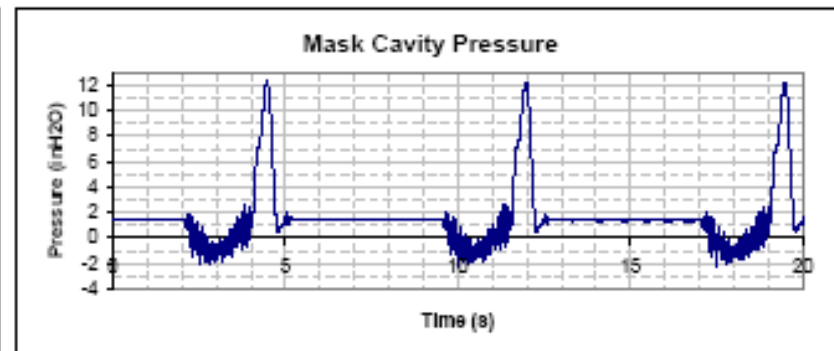
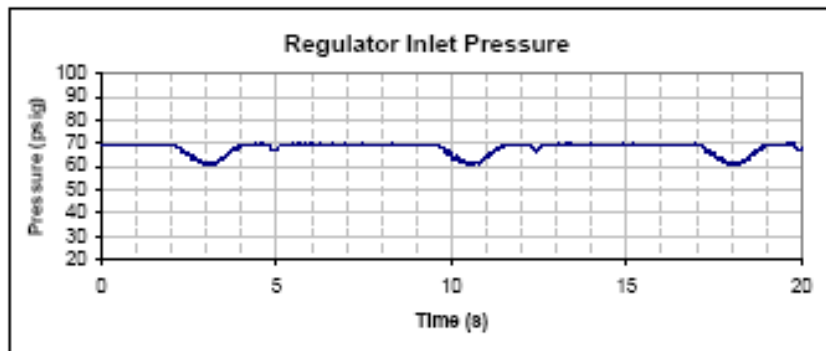
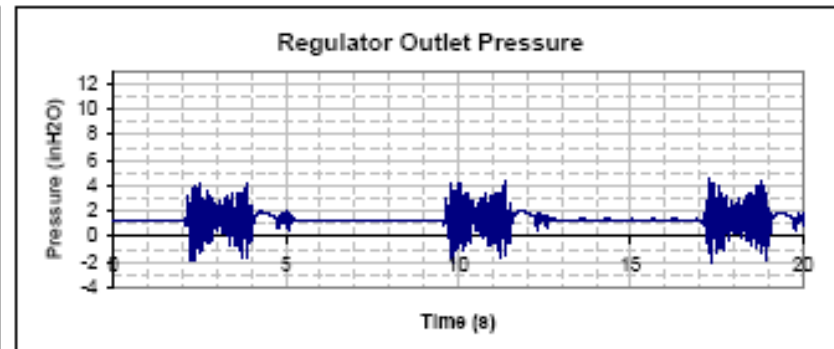
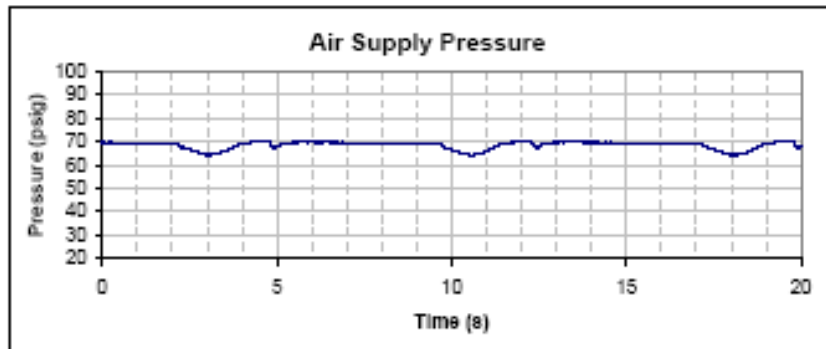
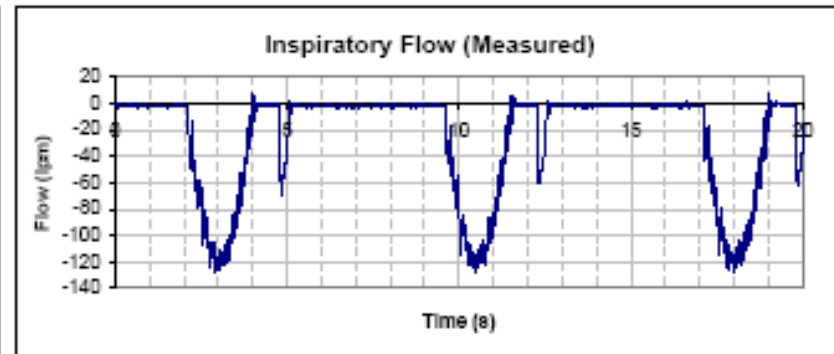
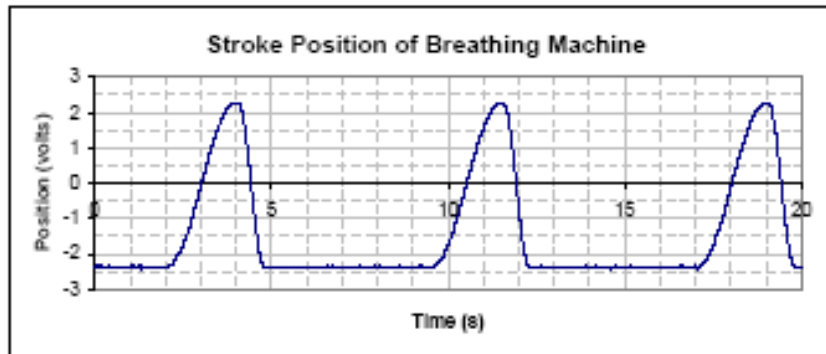
Peak Inspired Flow (lpm) 120

Altitude

GL

Inlet Pressure (psig) 70

Regulator Mode 100%



CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 3 - Varied Mode

Settings

Test #: 22

Breathing Rate (bpm) 22

Stroke Volume (l) 0.91

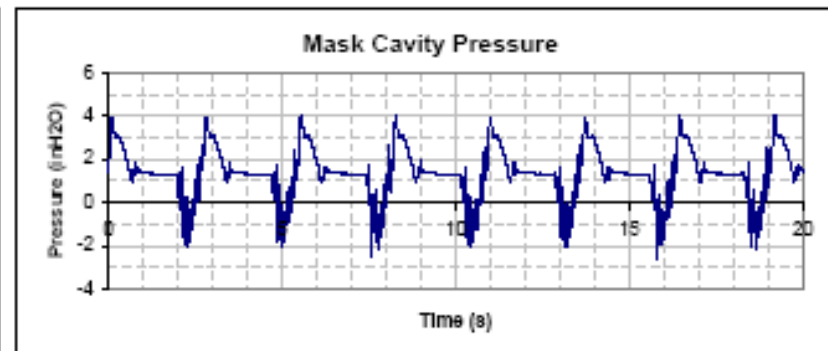
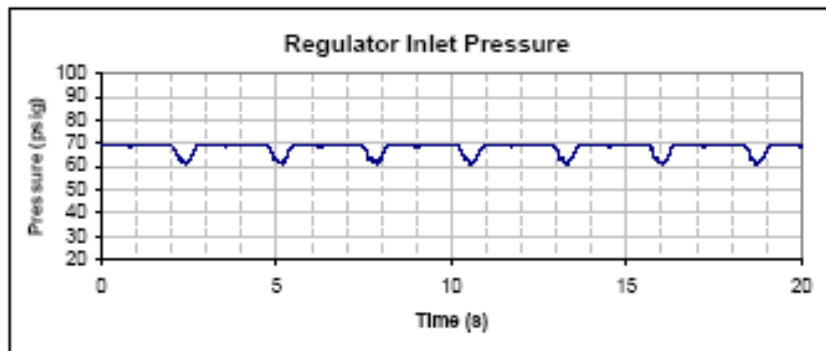
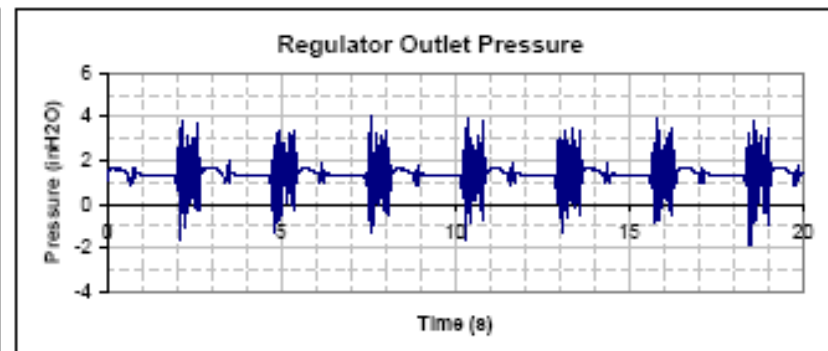
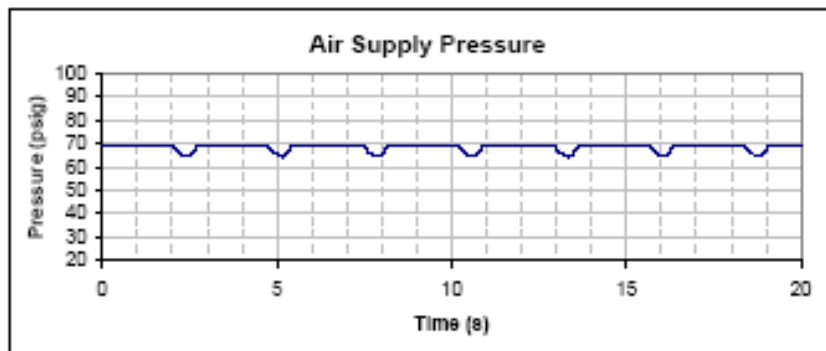
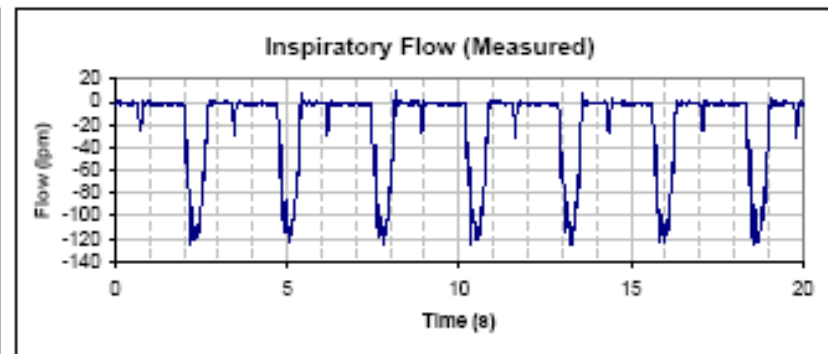
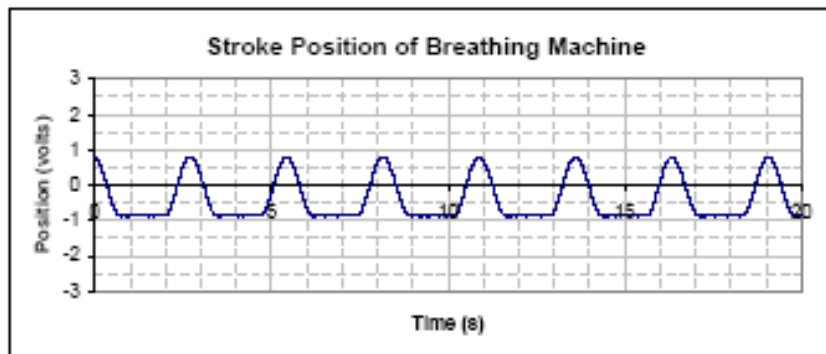
Minute Volume (l) 20

Peak Inspired Flow (lpm) 120

Altitude GL

Inlet Pressure (psig) 70

Regulator Mode 100%



CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 3 - Varied Mode

Settings

Test #: 23

Breathing Rate (bpm) 15

Stroke Volume (l) 0.33

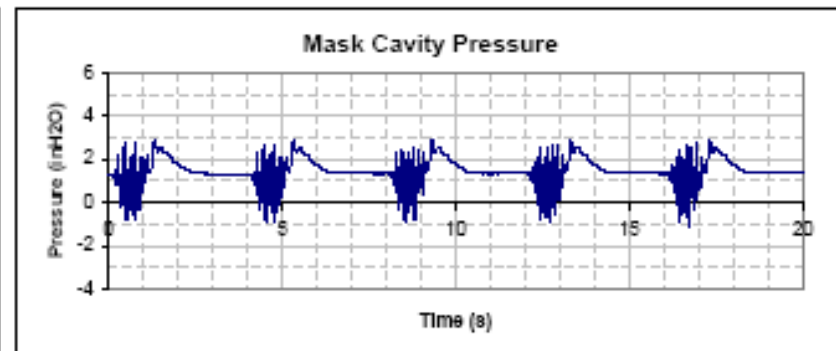
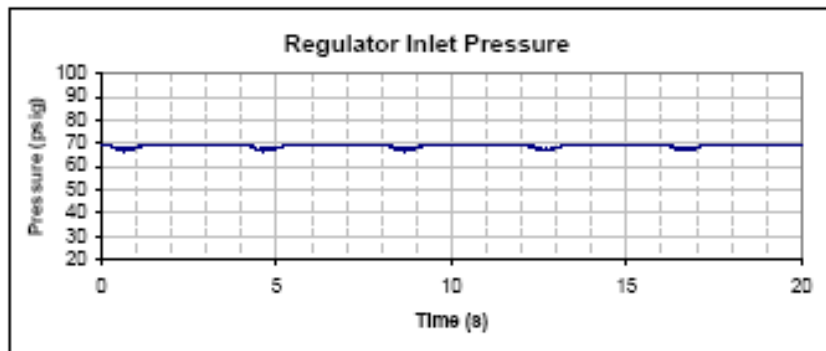
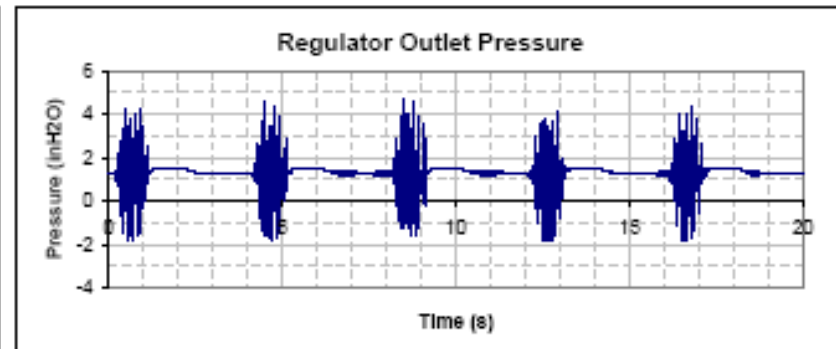
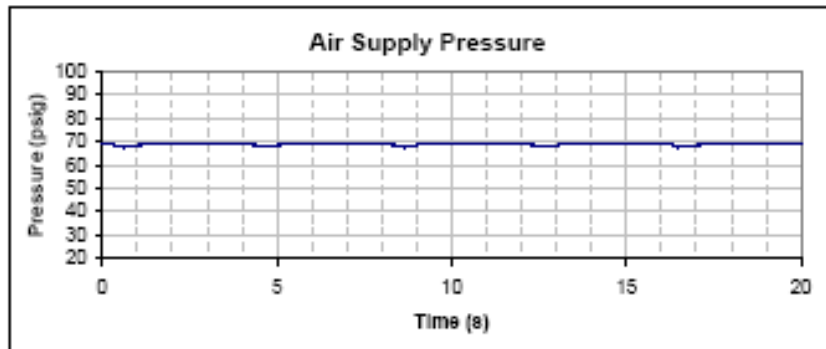
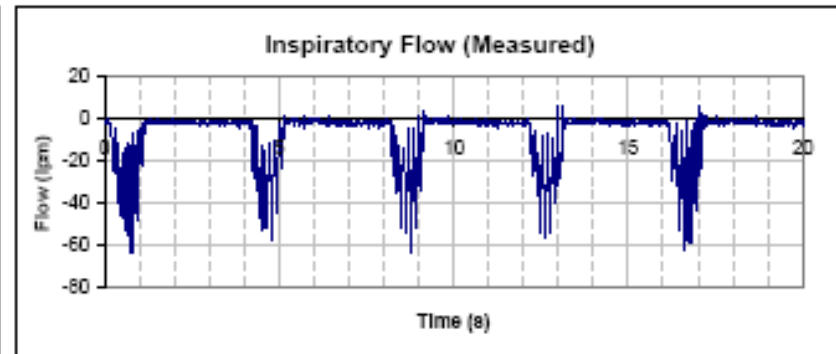
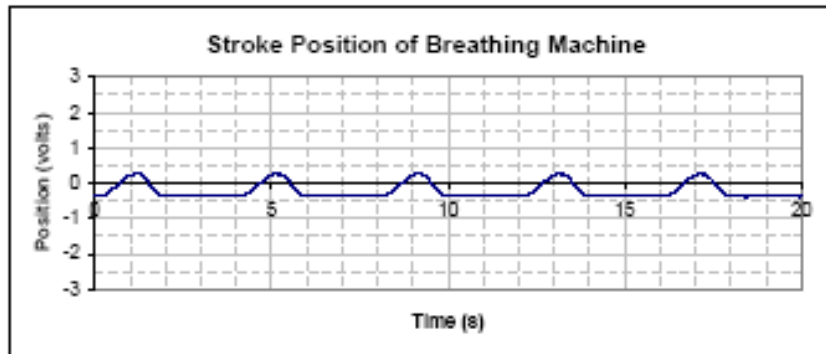
Minute Volume (l) 5

Peak Inspired Flow (lpm) 30

Altitude GL

Inlet Pressure (psig) 70

Regulator Mode 100%



CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 3 - Varied Mode

Settings

Test #: 24

Breathing Rate (bpm) 15

Stroke Volume (l) 2.5

Minute Volume (l) 37.5

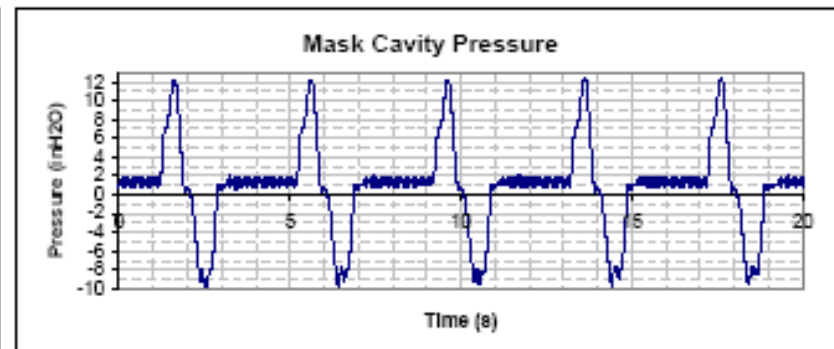
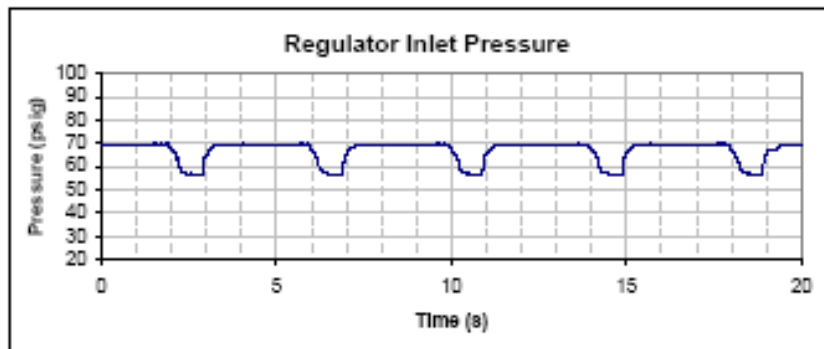
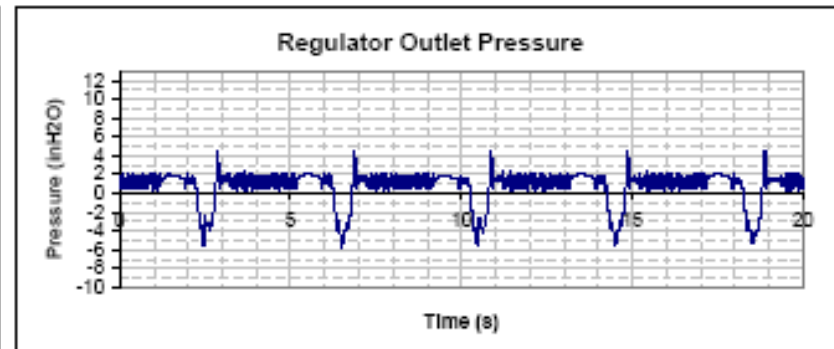
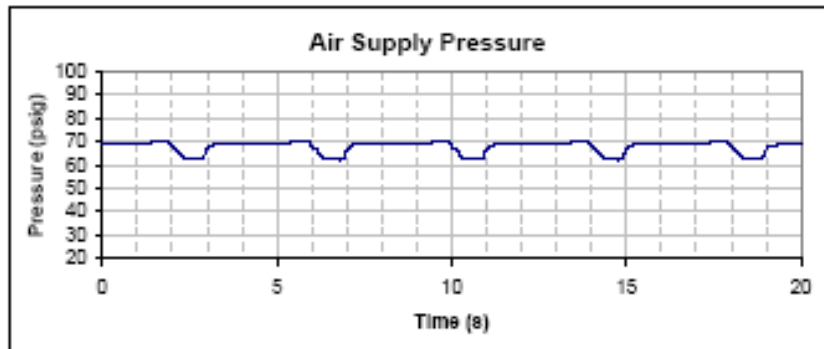
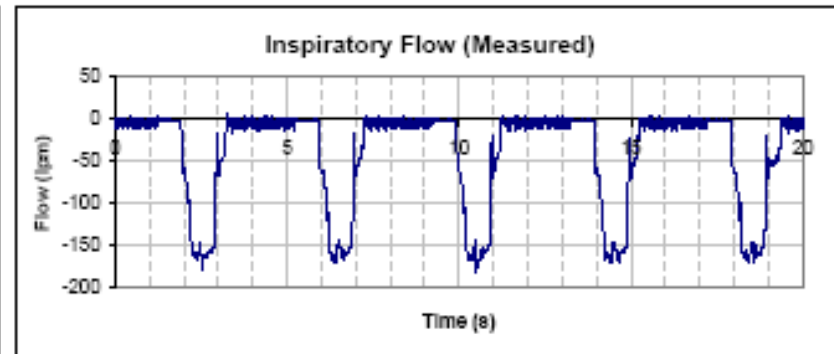
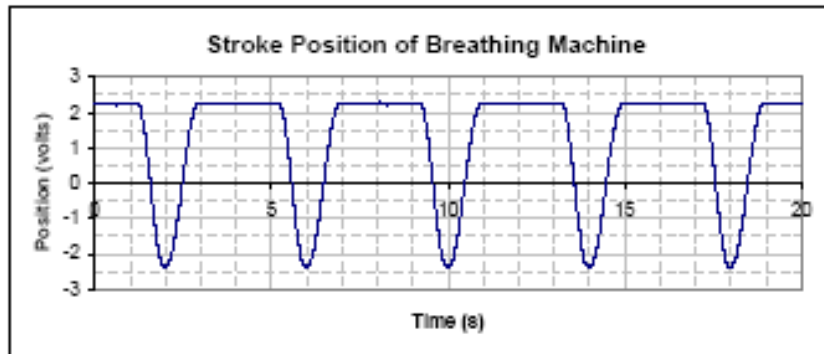
Peak Inspired Flow (lpm) 250

Altitude

GL

Inlet Pressure (psig) 70

Regulator Mode 100%



CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 3 - Varied Mode

Settings

Test #: 25

Breathing Rate (bpm)

15

Stroke Volume (l)

1.33

Minute Volume (l)

20

Peak Inspired Flow (lpm)

80

Altitude

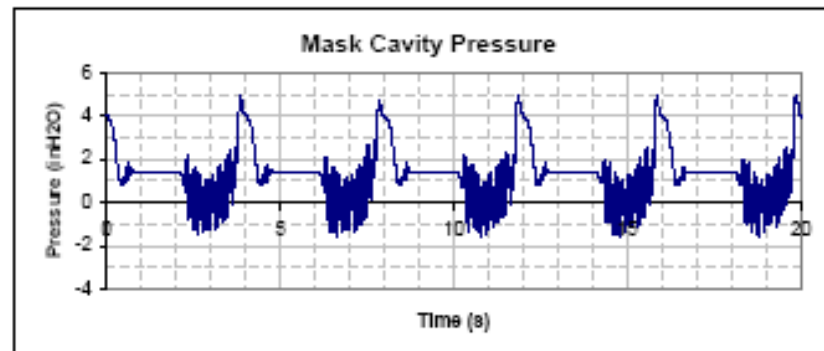
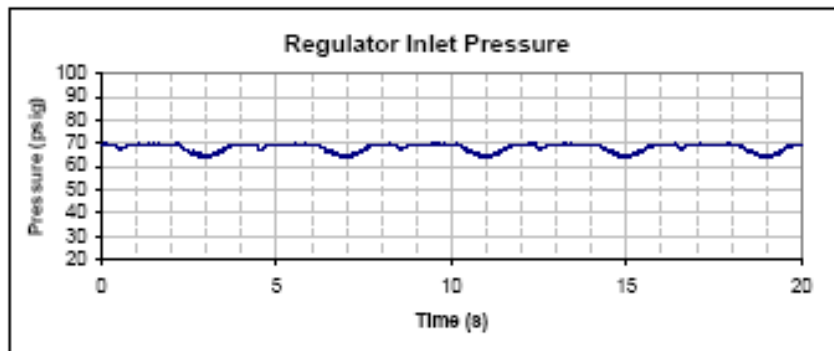
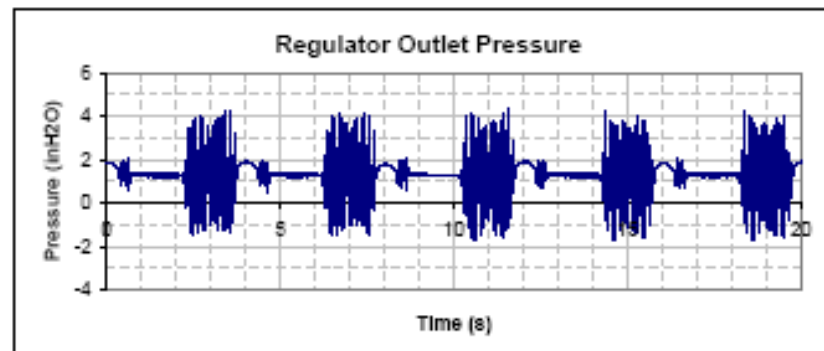
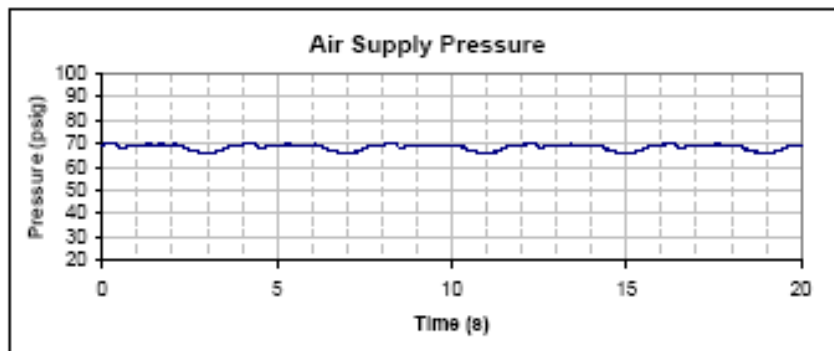
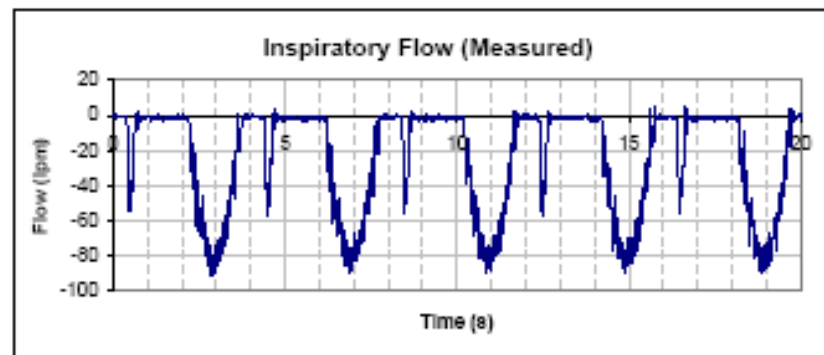
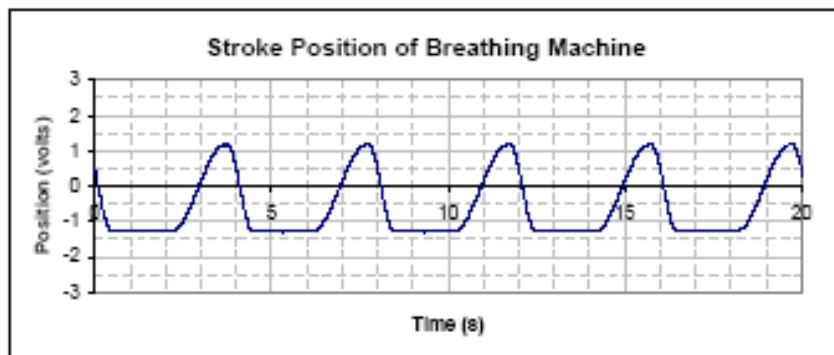
GL

Inlet Pressure (psig)

70

Regulator Mode

100%



CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 3 - Varied Mode

Settings

Test #: 28

Breathing Rate (bpm) 15

Stroke Volume (l) 1.33

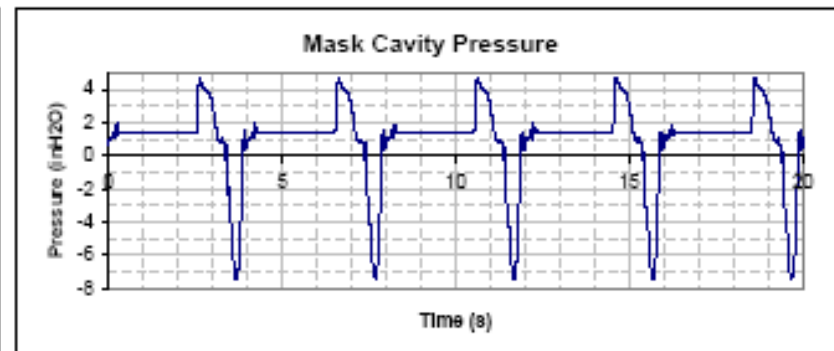
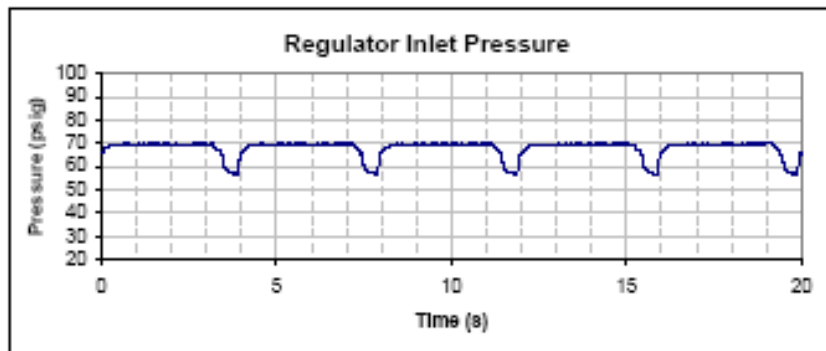
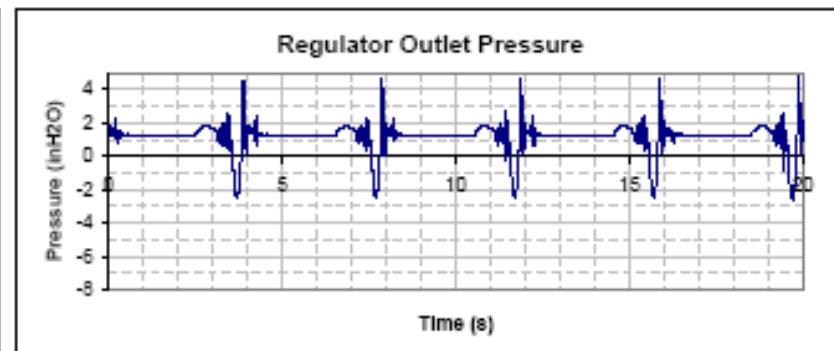
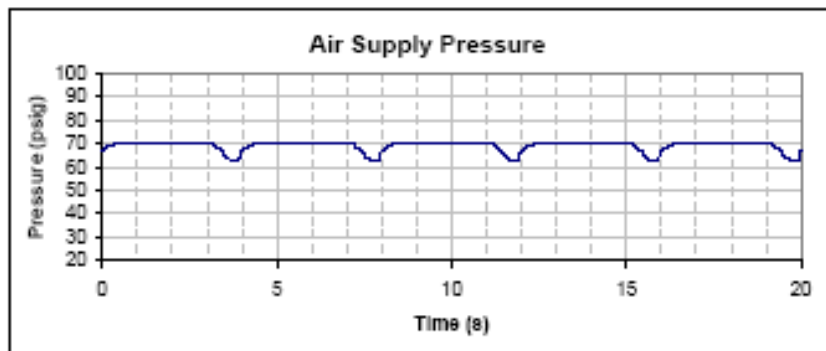
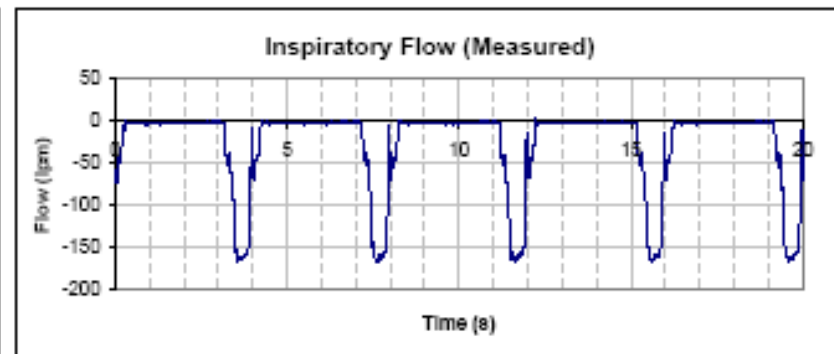
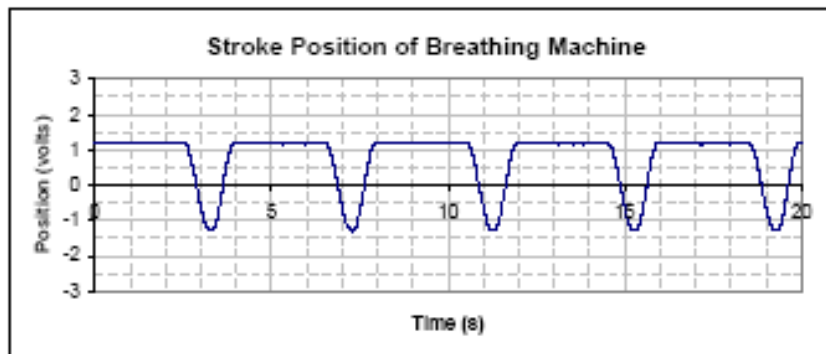
Minute Volume (l) 20

Peak Inspired Flow (lpm) 200

Altitude GL

Inlet Pressure (psig) 70

Regulator Mode 100%





CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 4 - Varied Altitude

Test #: 27

Settings

Breathing Rate (bpm)

15

Stroke Volume (l)

1.33

Minute Volume (l)

20

Peak Inspired Flow (lpm)

120

Altitude

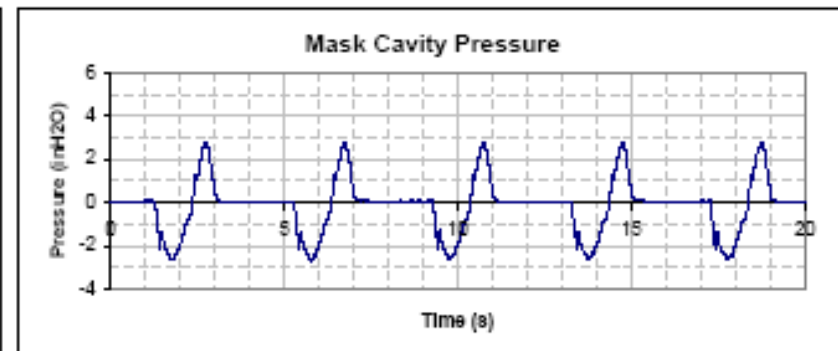
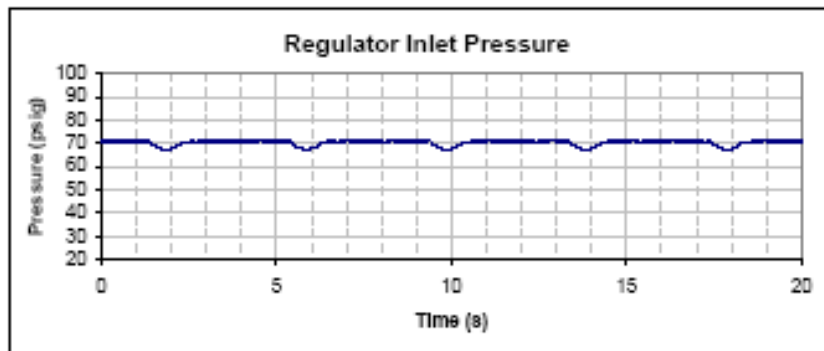
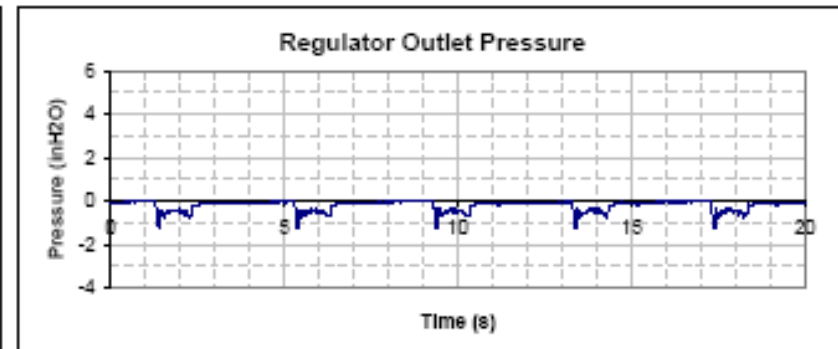
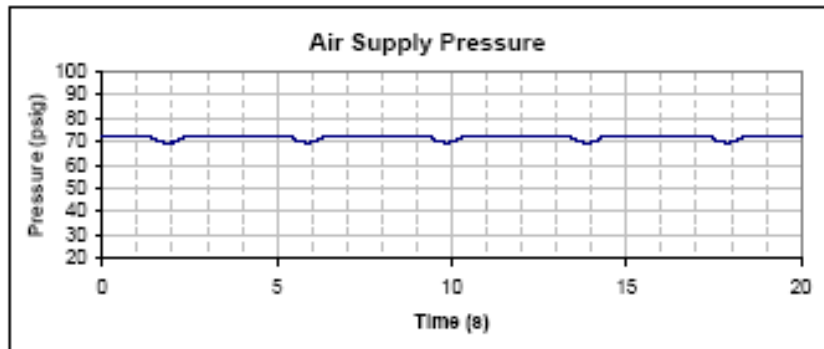
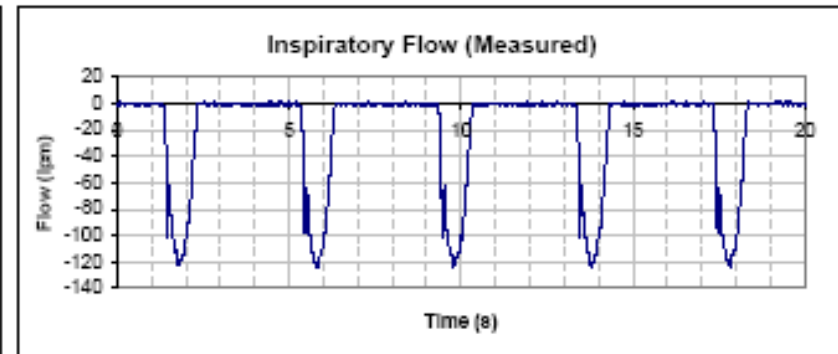
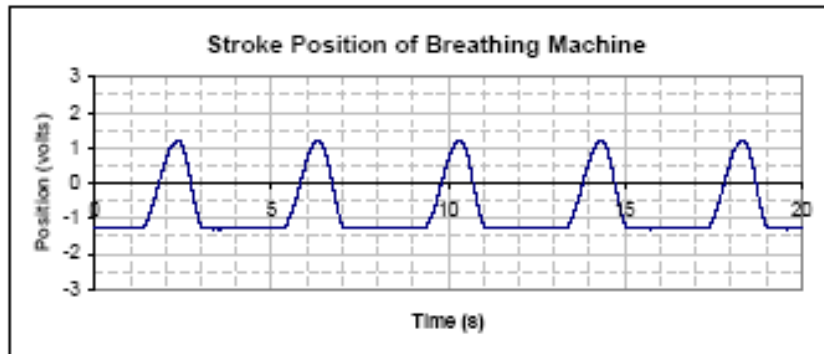
7.5

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 28

Breathing Rate (bpm)

8

Stroke Volume (l)

2.5

Minute Volume (l)

20

Peak Inspired Flow (lpm)

120

Altitude

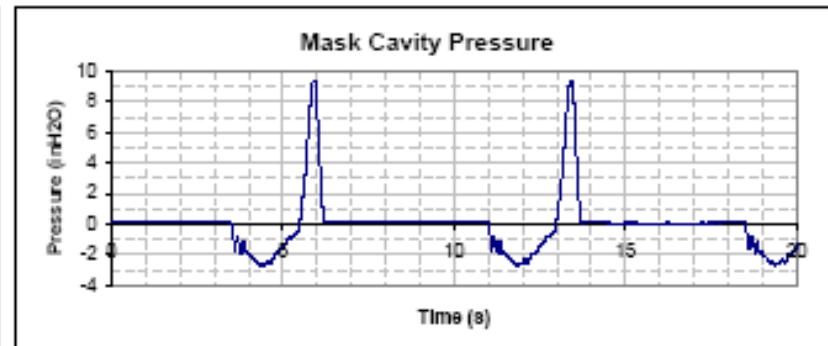
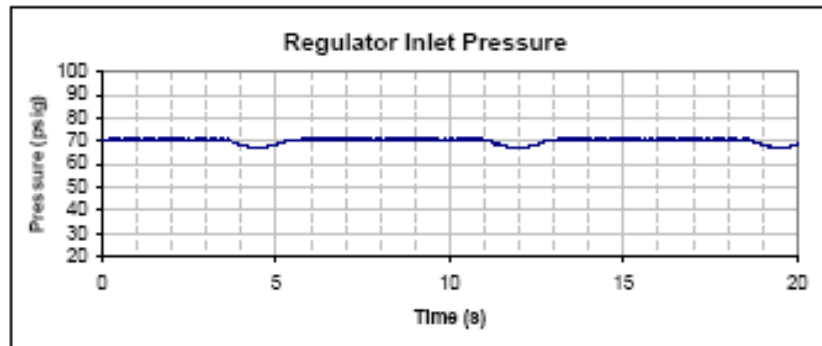
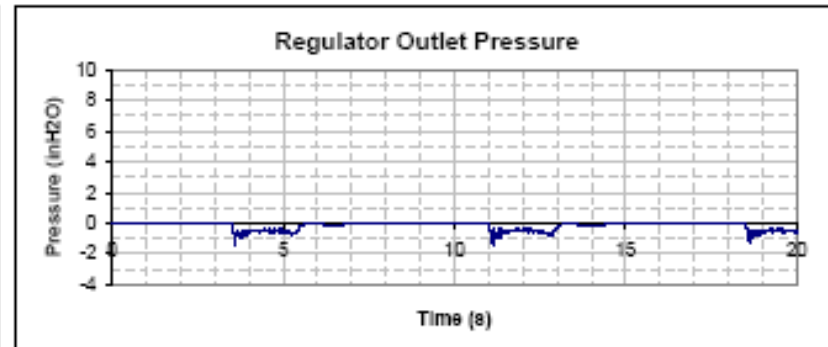
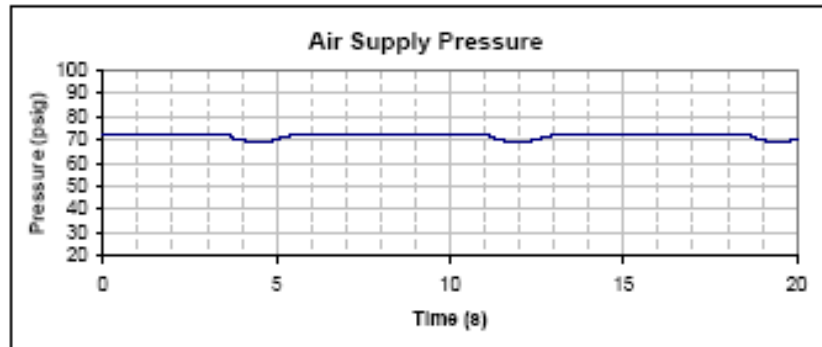
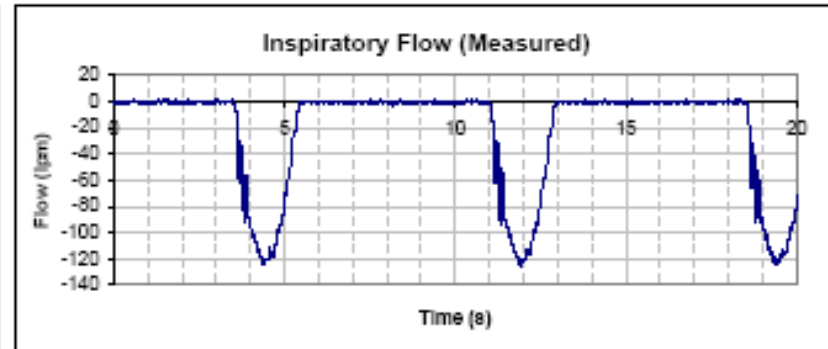
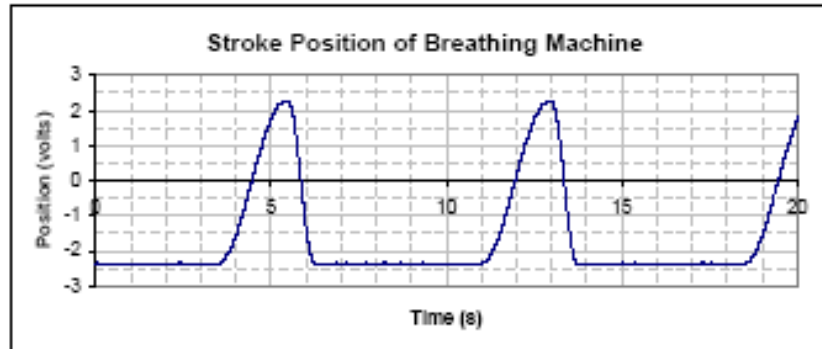
7.5

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 29

Breathing Rate (bpm)

22

Stroke Volume (l)

0.91

Minute Volume (l)

20

Peak Inspired Flow (lpm)

120

Altitude

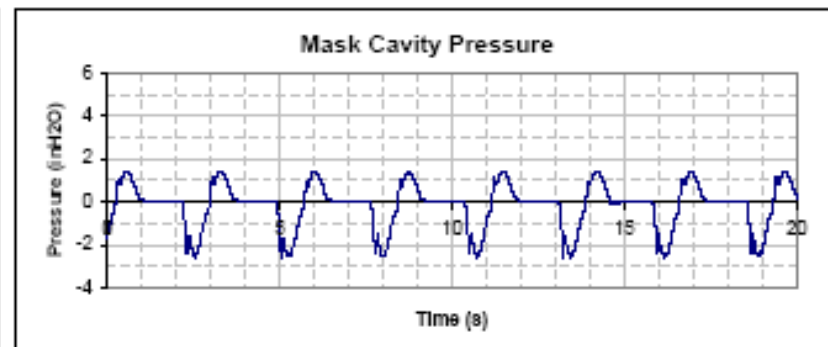
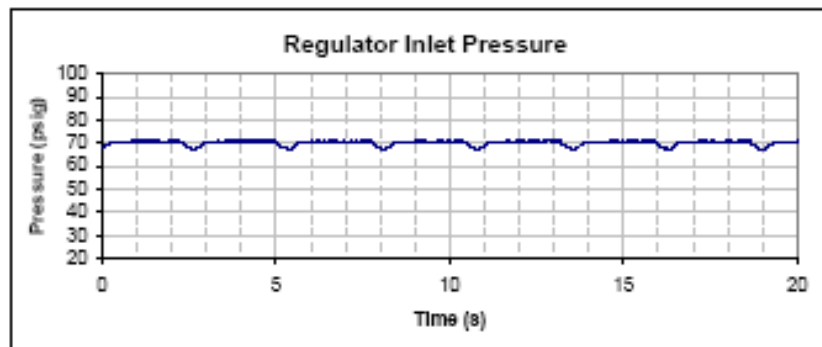
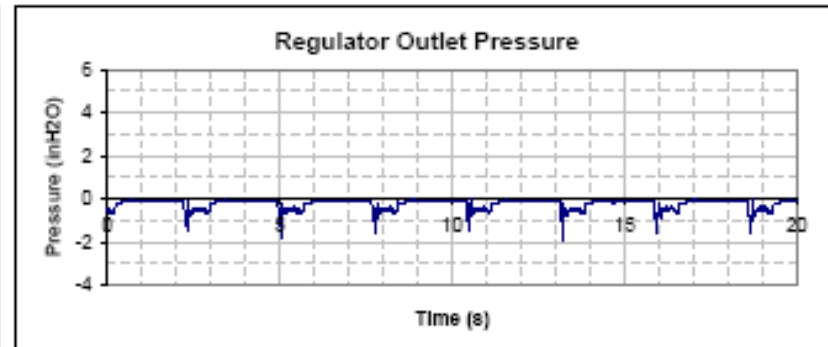
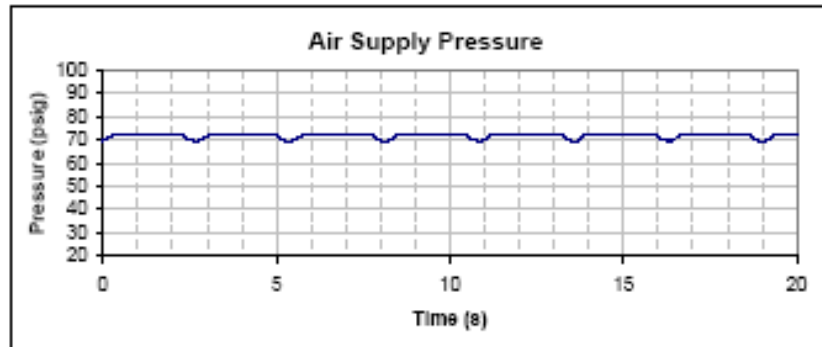
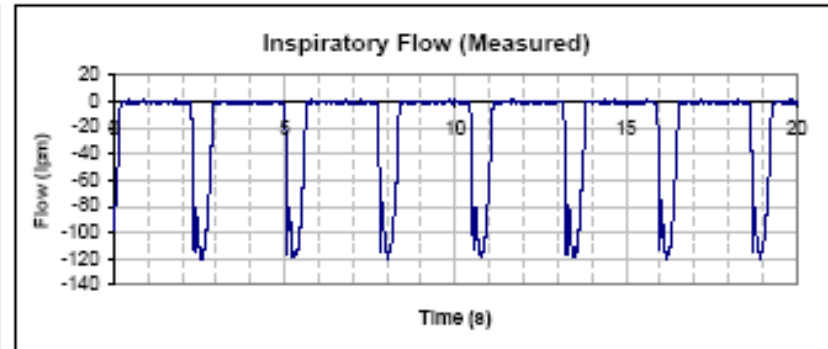
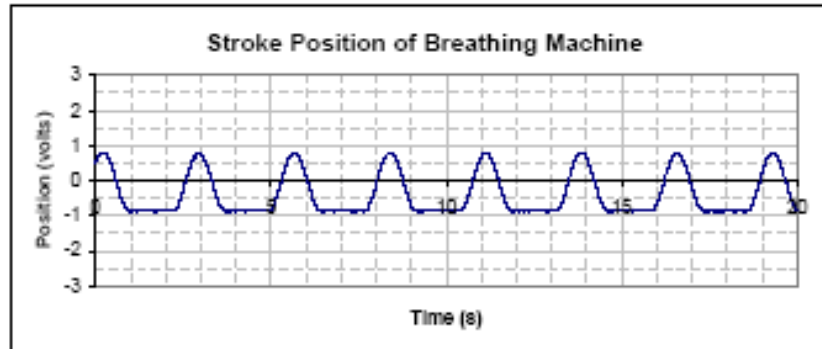
7.5

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 30

Breathing Rate (bpm)

15

Stroke Volume (l)

0.33

Minute Volume (l)

5

Peak Inspired Flow (lpm)

30

Altitude

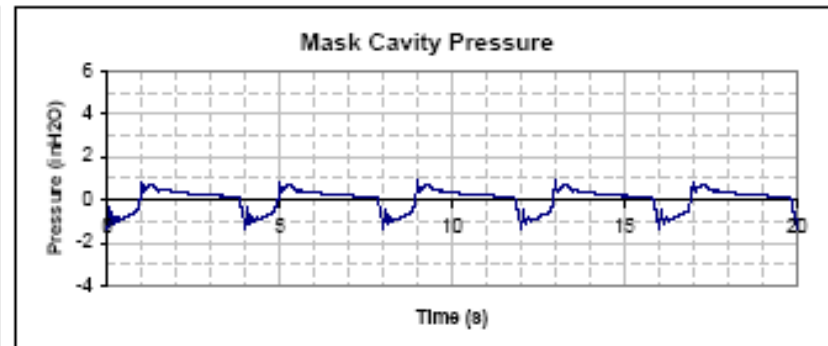
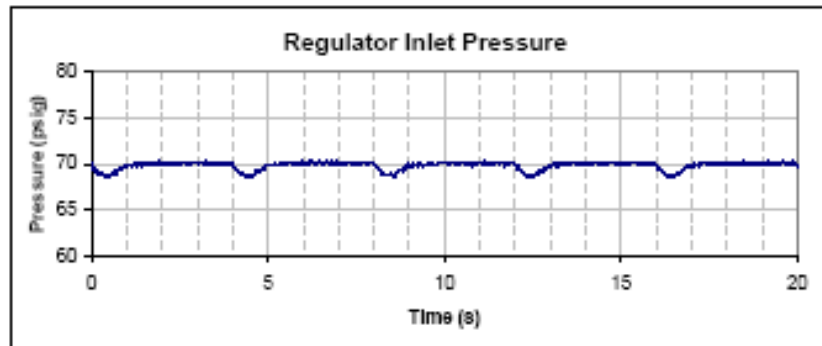
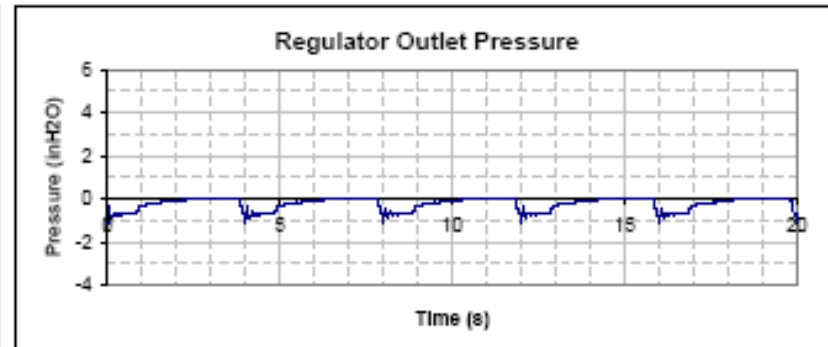
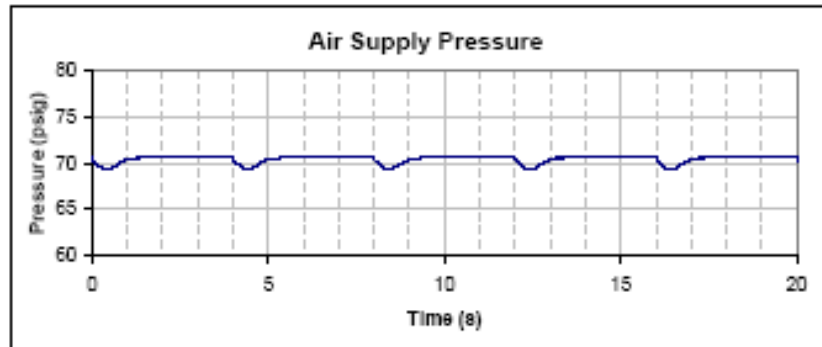
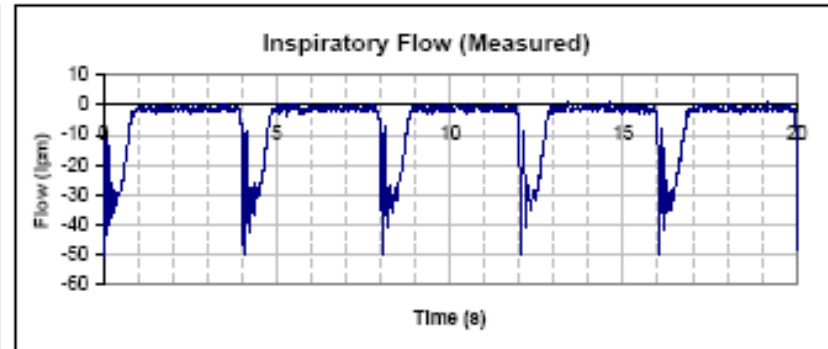
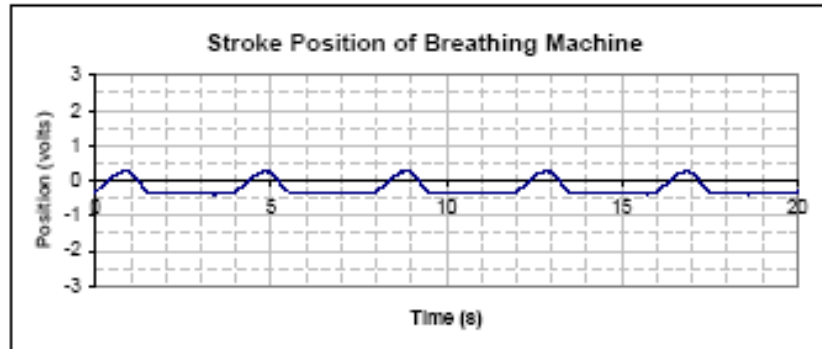
7.5

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 31

Breathing Rate (bpm)

15

Stroke Volume (l)

2.5

Minute Volume (l)

37.5

Peak Inspired Flow (lpm)

250

Altitude

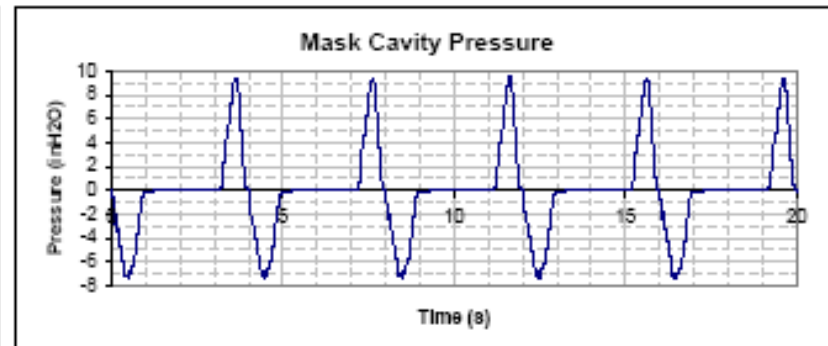
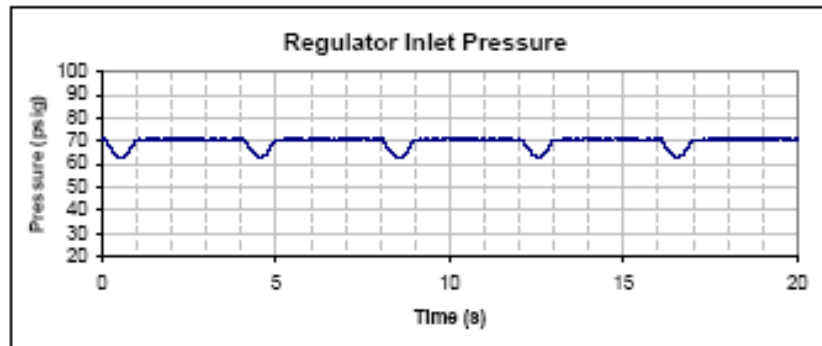
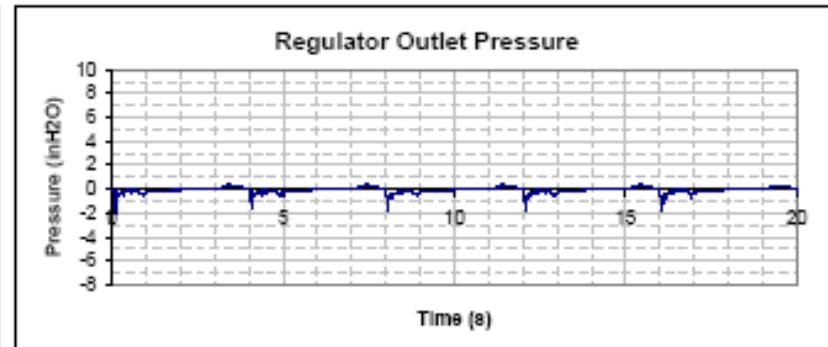
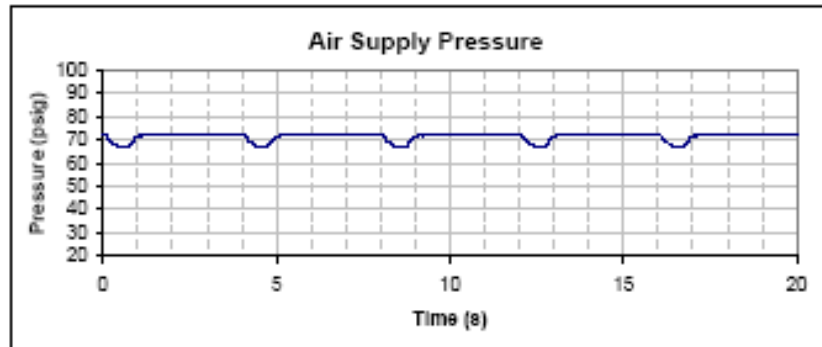
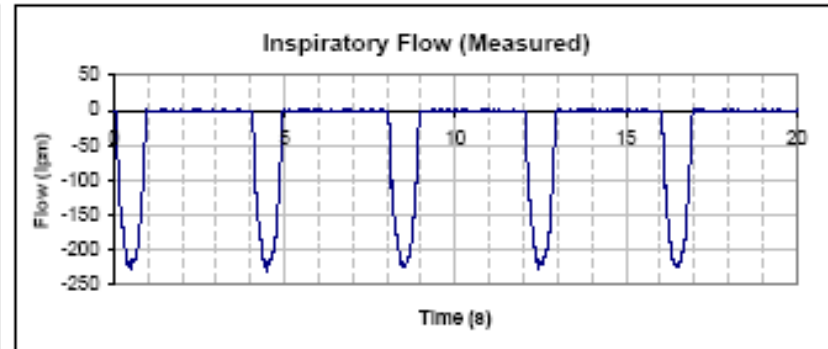
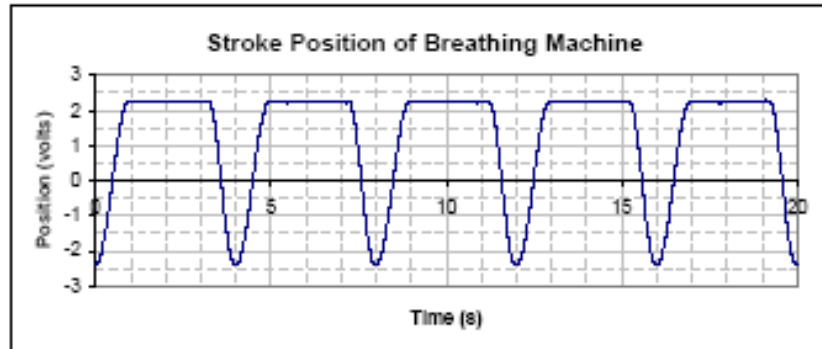
7.5

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 32

Breathing Rate (bpm)

15

Stroke Volume (l)

1.33

Minute Volume (l)

20

Peak Inspired Flow (lpm)

80

Altitude

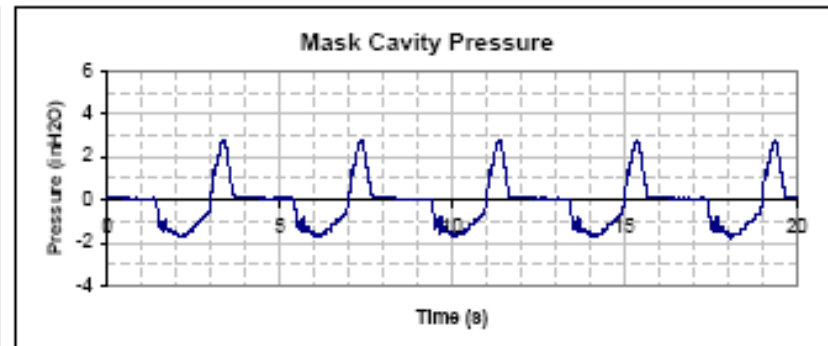
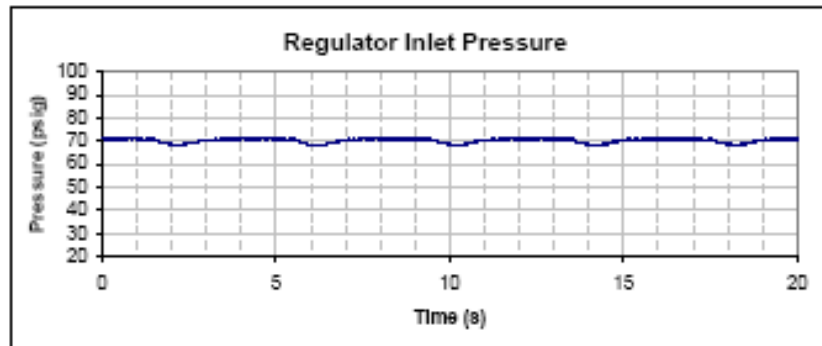
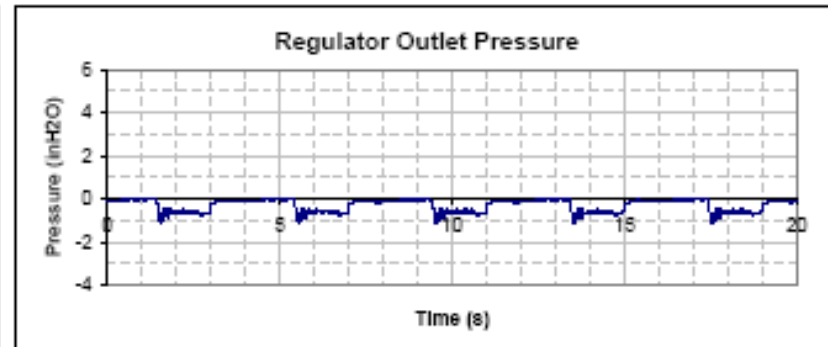
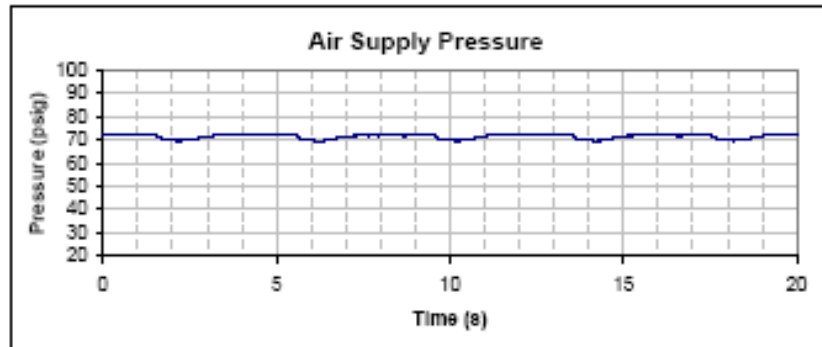
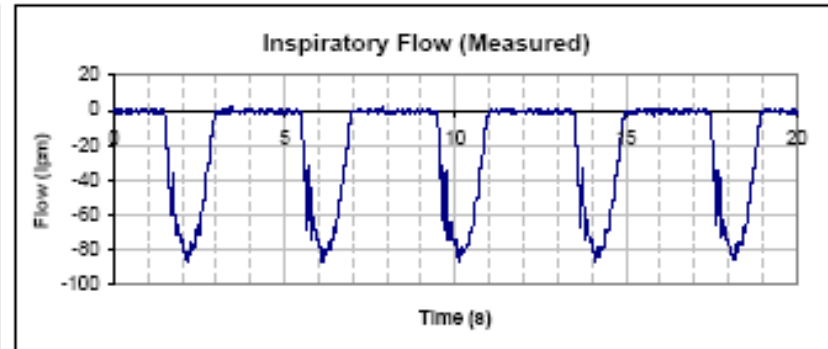
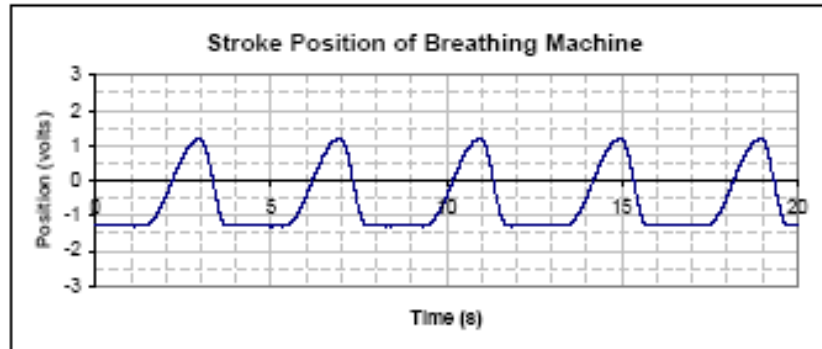
7.5

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 33

Breathing Rate (bpm)

15

Stroke Volume (l)

1.33

Minute Volume (l)

20

Peak Inspired Flow (lpm)

200

Altitude

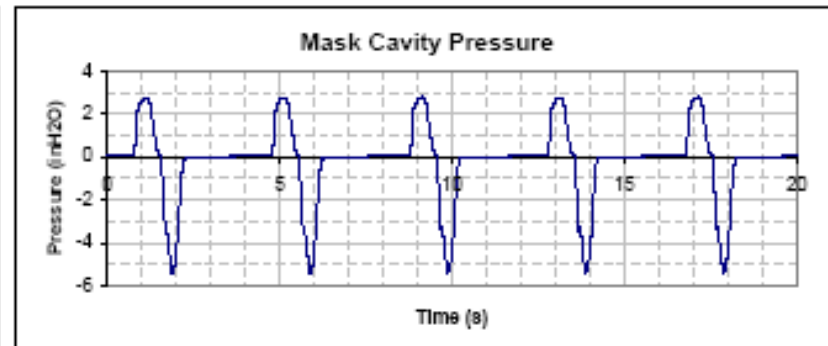
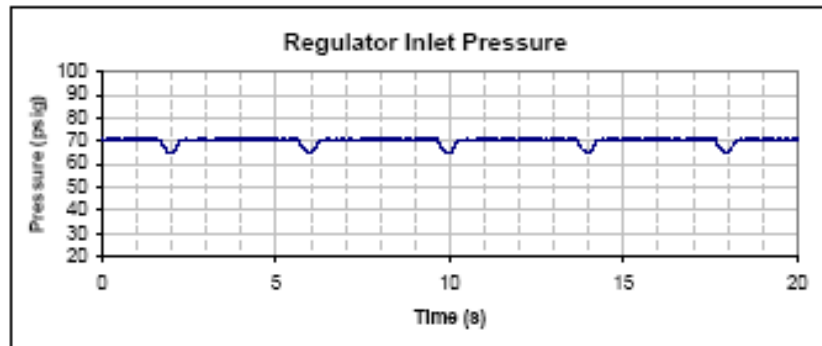
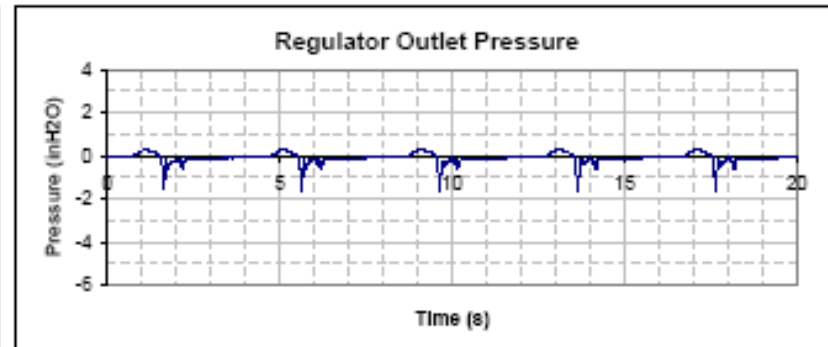
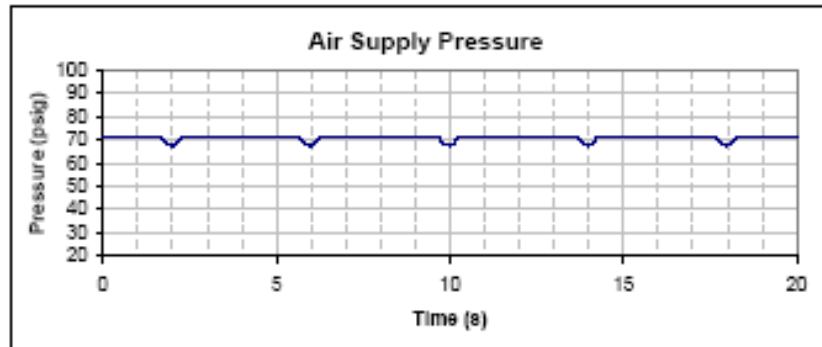
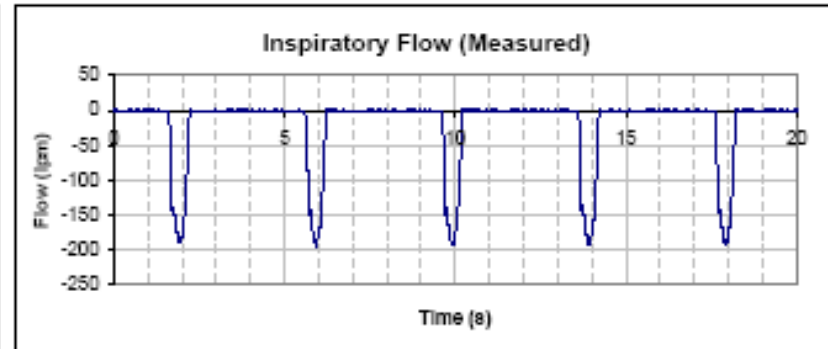
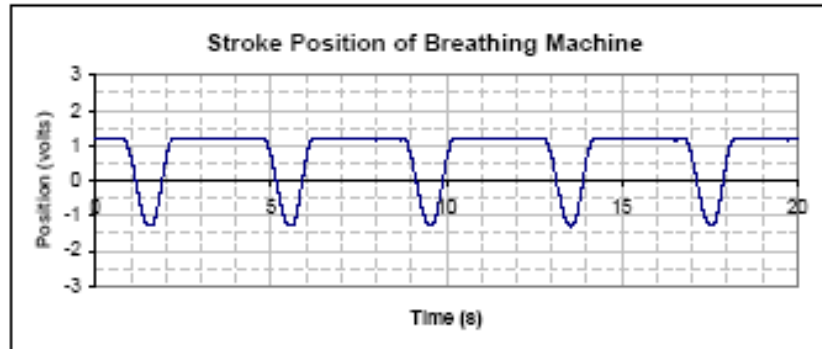
7.5

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 34

Breathing Rate (bpm)

15

Stroke Volume (l)

1.33

Minute Volume (l)

20

Peak Inspired Flow (lpm)

120

Altitude

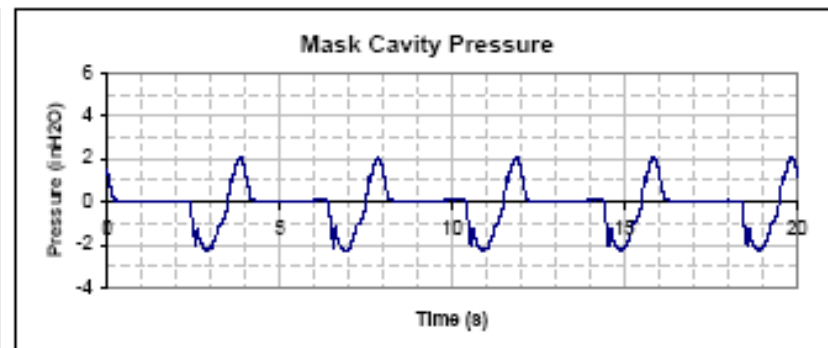
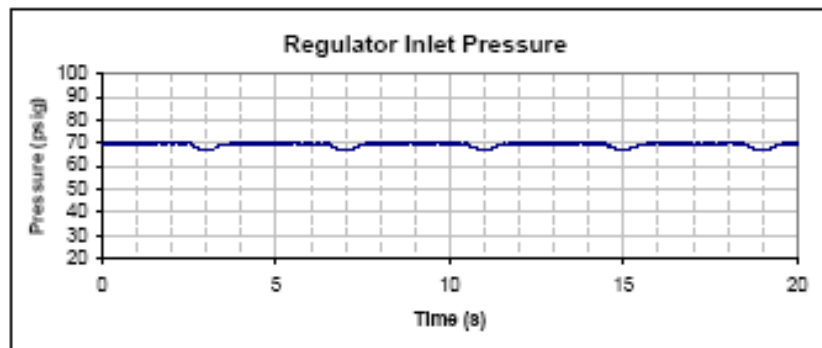
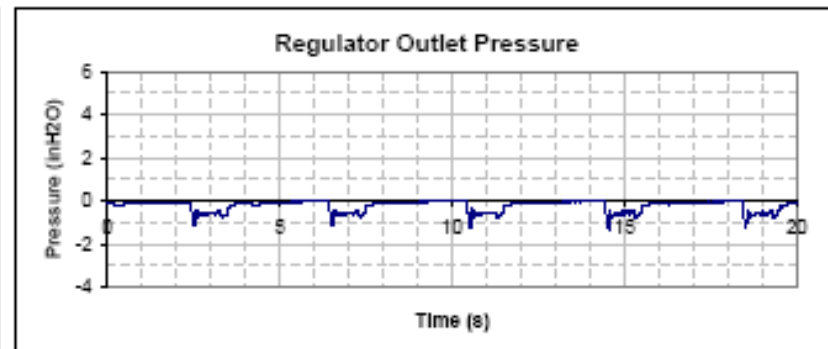
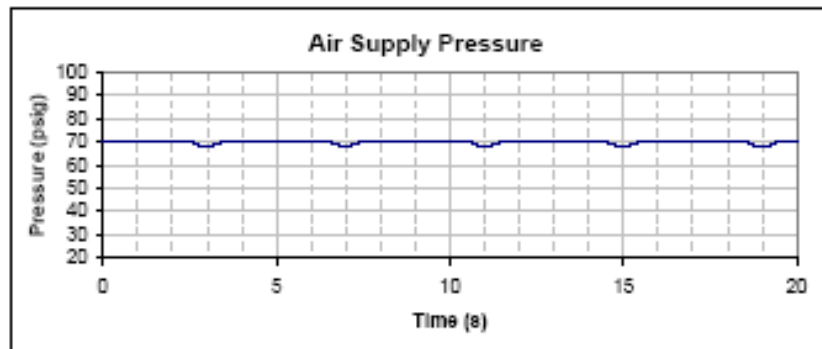
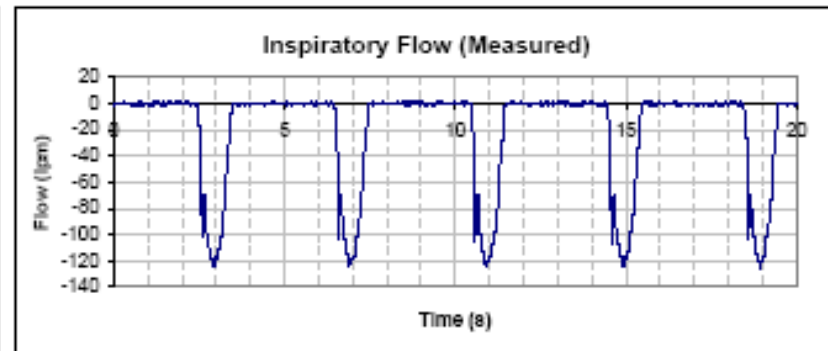
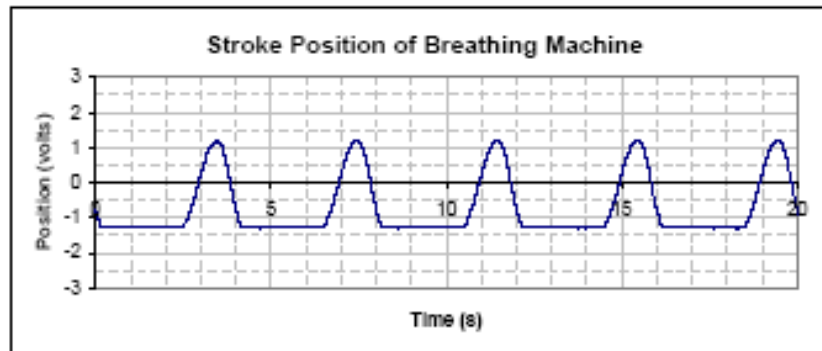
15

Inlet Pressure (psig)

70

Regulator Mode

Dilution





CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 35

Breathing Rate (bpm)

8

Stroke Volume (l)

2.5

Minute Volume (l)

20

Peak Inspired Flow (lpm)

120

Altitude

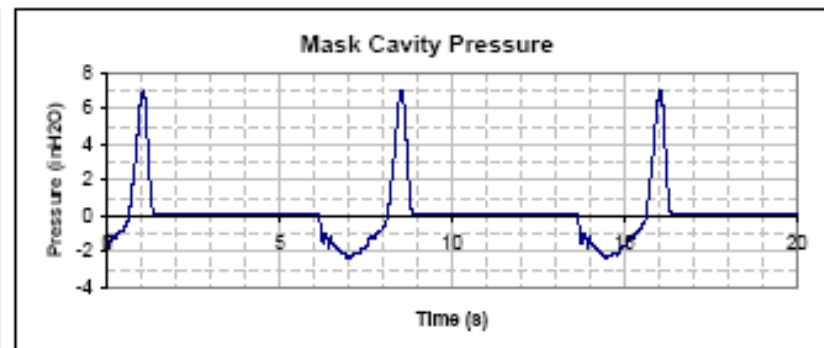
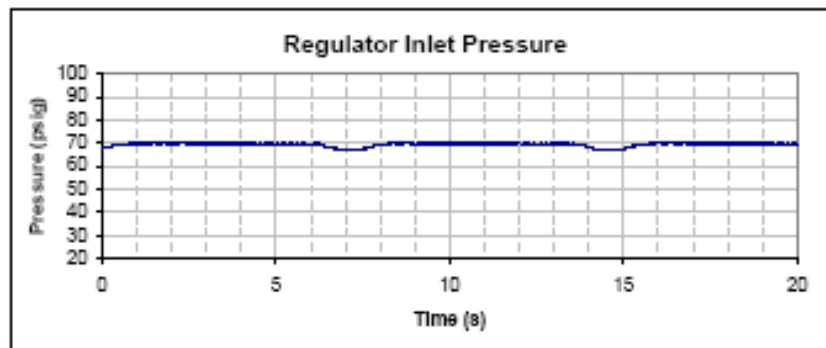
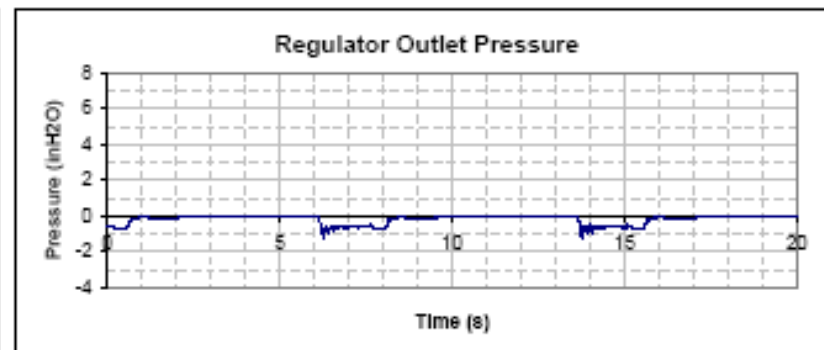
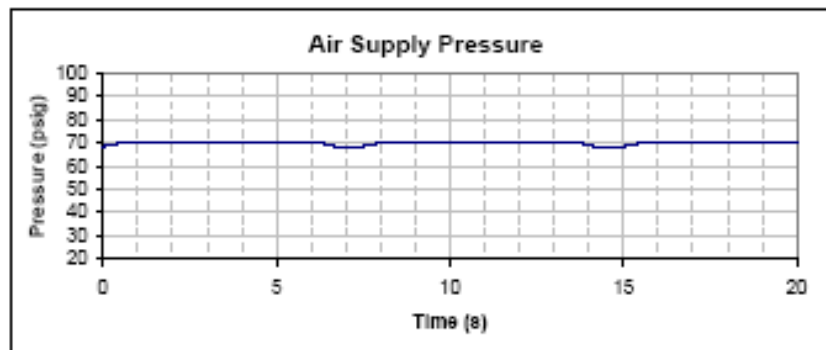
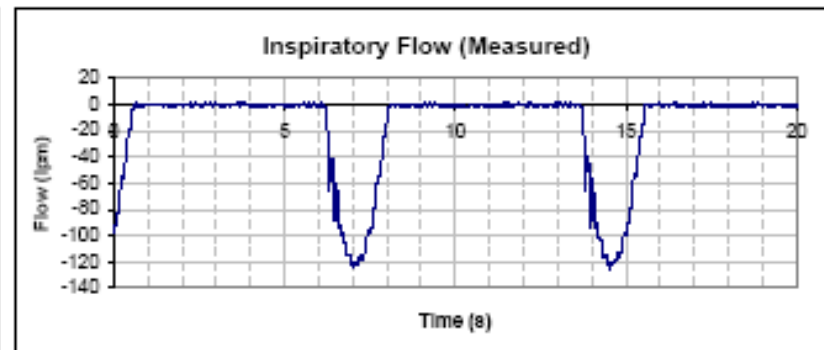
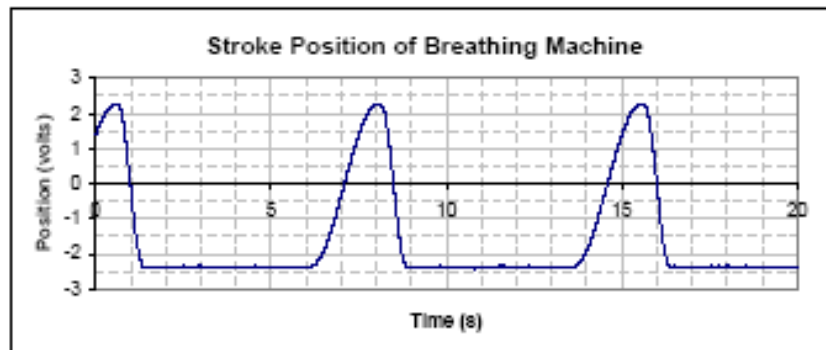
15

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 36

Breathing Rate (bpm)

22

Stroke Volume (l)

0.91

Minute Volume (l)

20

Peak Inspired Flow (lpm)

120

Altitude

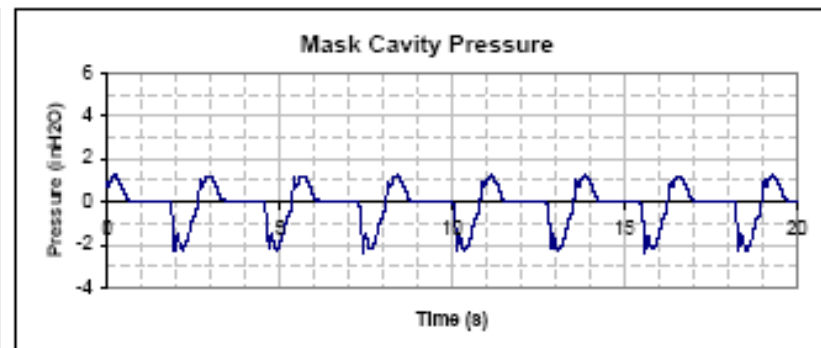
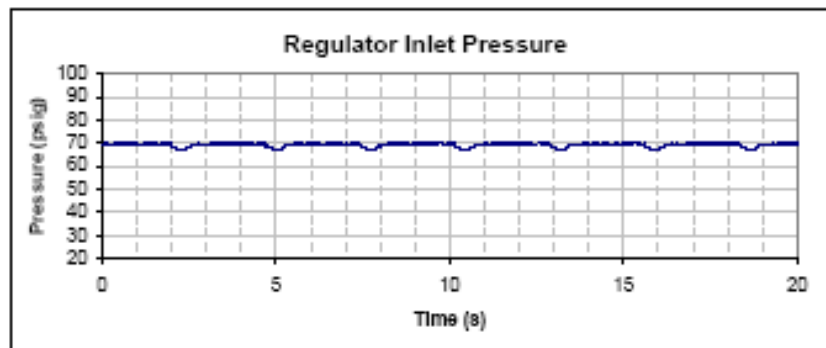
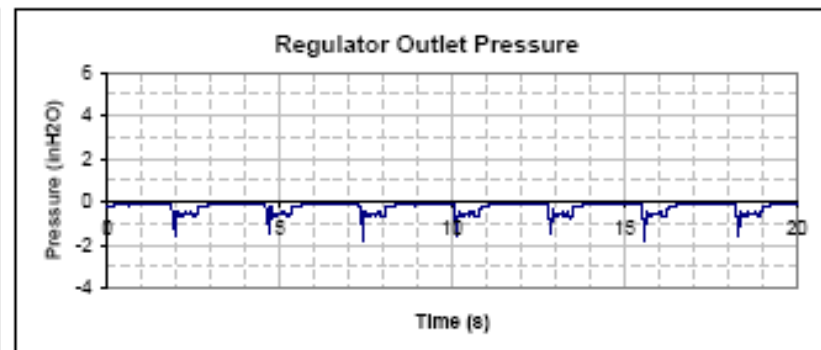
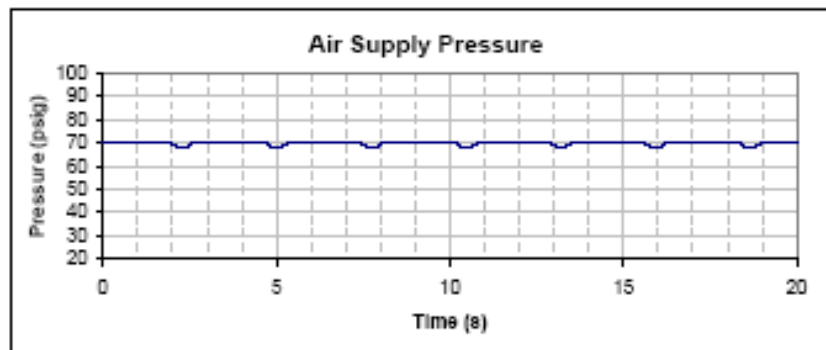
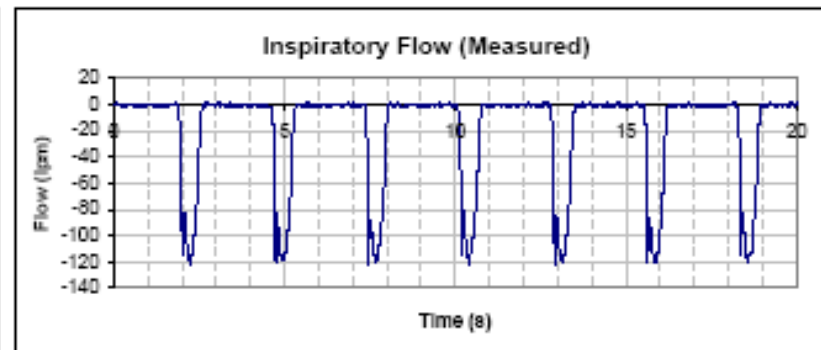
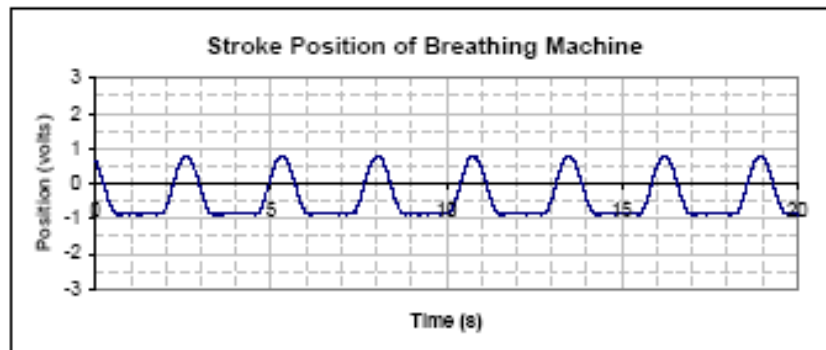
15

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 37

Breathing Rate (bpm)

15

Stroke Volume (l)

0.33

Minute Volume (l)

5

Peak Inspired Flow (lpm)

30

Altitude

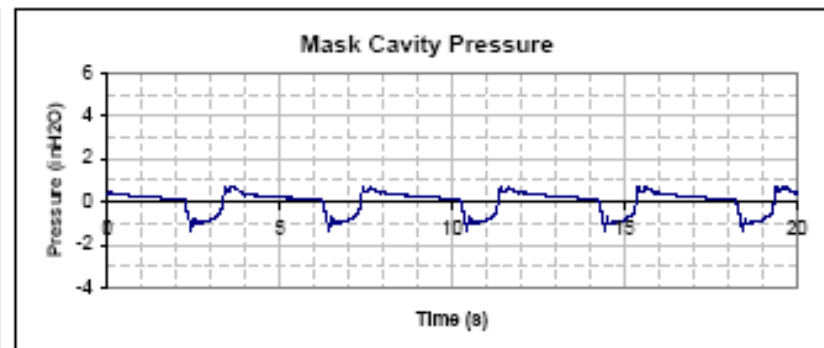
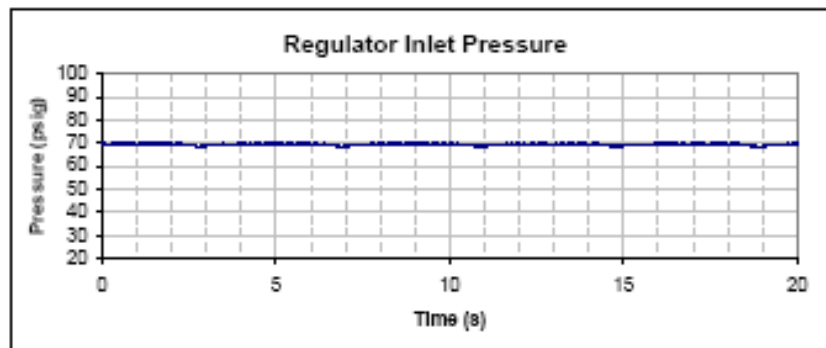
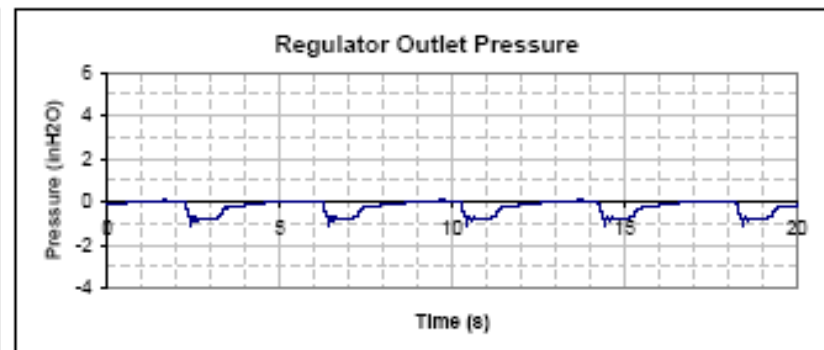
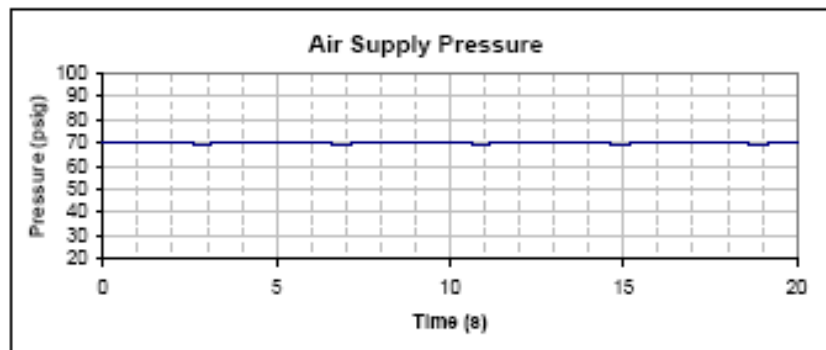
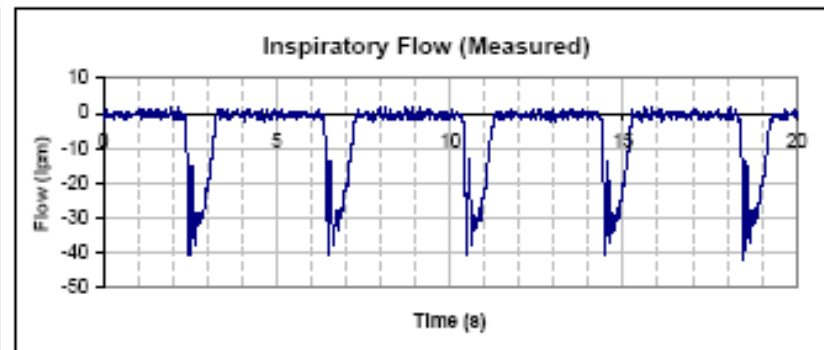
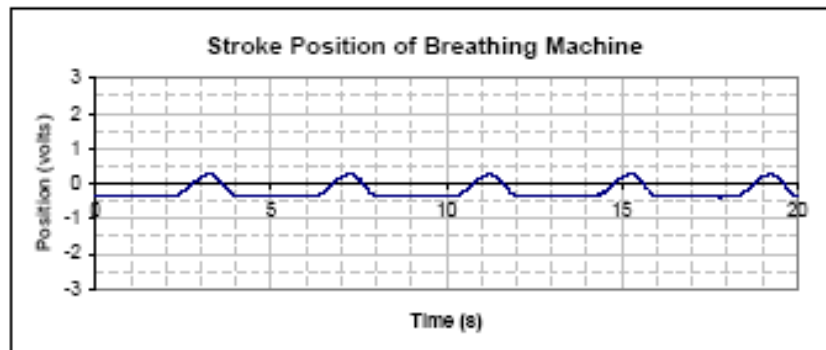
15

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 38

Breathing Rate (bpm)

15

Stroke Volume (l)

2.5

Minute Volume (l)

37.5

Peak Inspired Flow (lpm)

250

Altitude

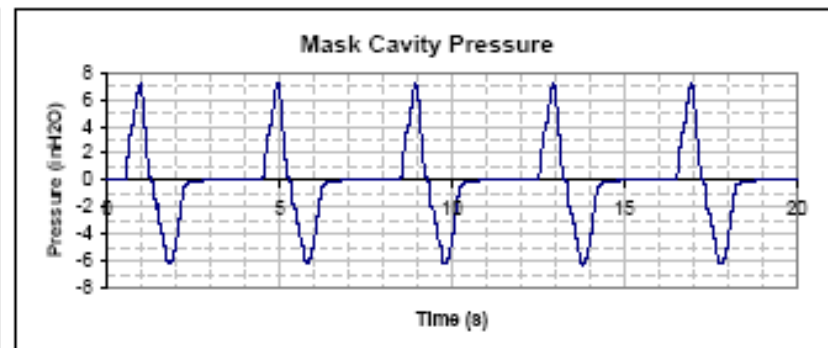
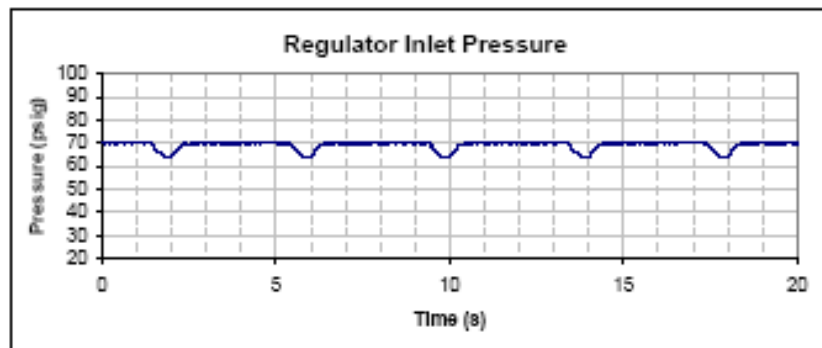
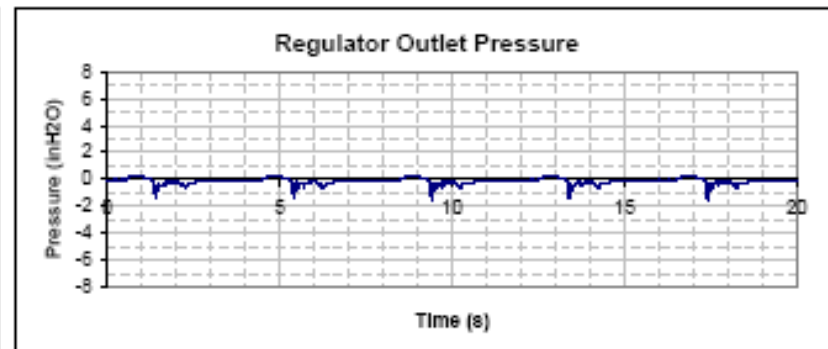
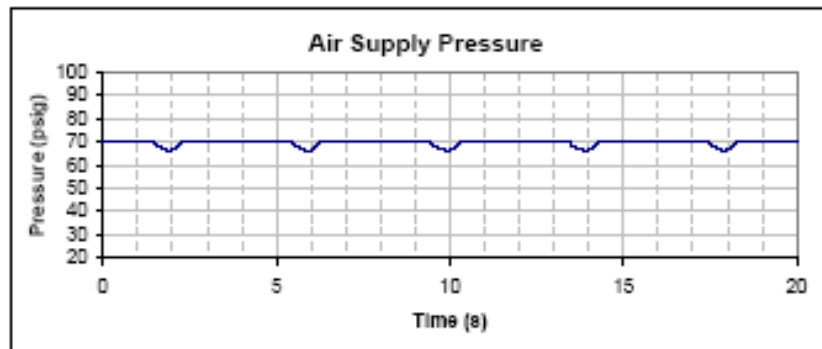
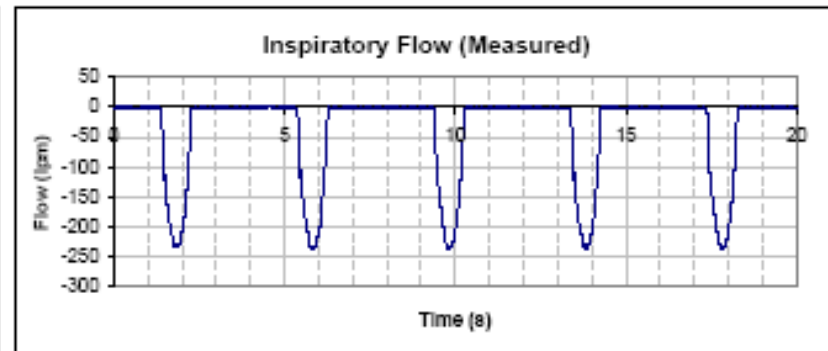
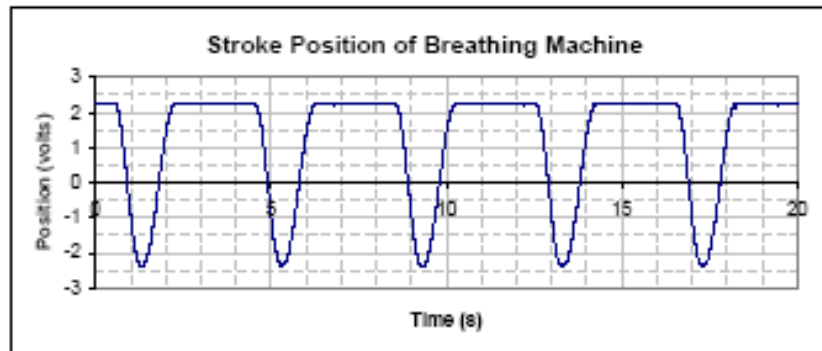
15

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 39

Breathing Rate (bpm)

15

Stroke Volume (l)

1.33

Minute Volume (l)

20

Peak Inspired Flow (lpm)

80

Altitude

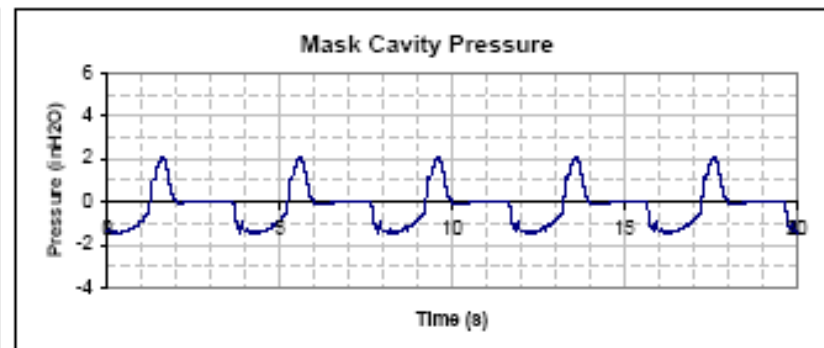
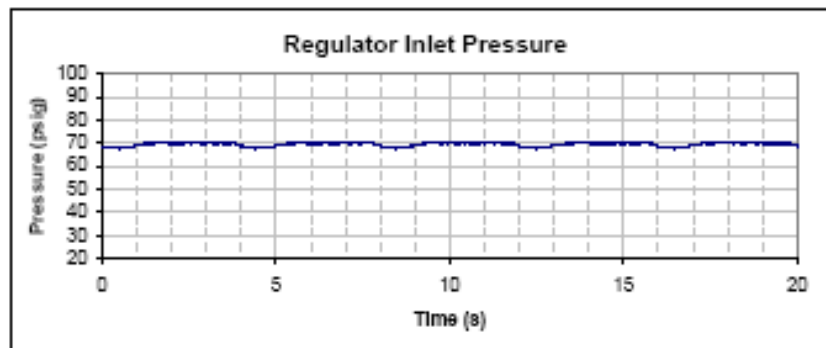
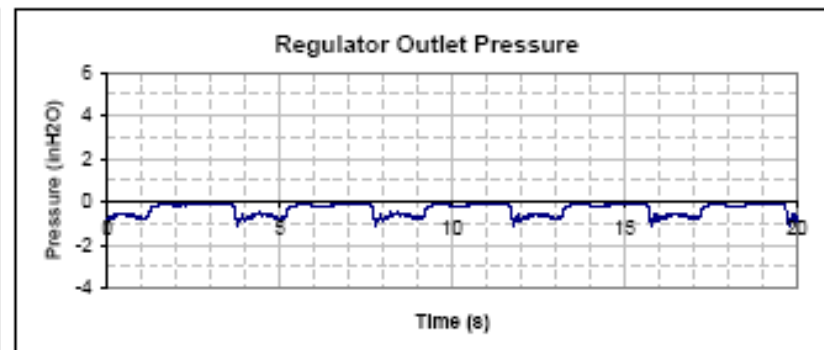
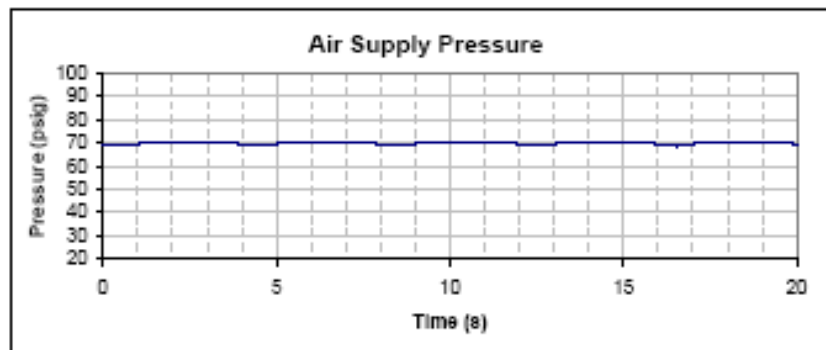
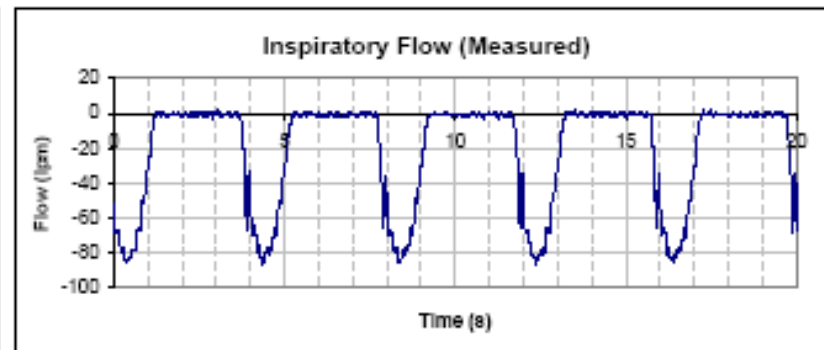
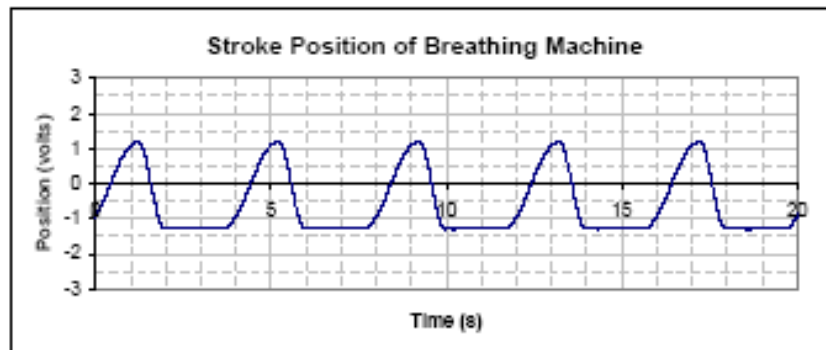
15

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Test #: 40

Settings

Breathing Rate (bpm)

15

Stroke Volume (l)

1.33

Minute Volume (l)

20

Peak Inspired Flow (lpm)

200

Altitude

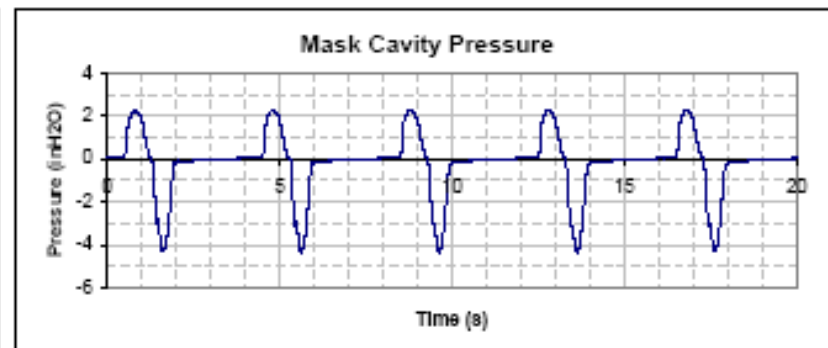
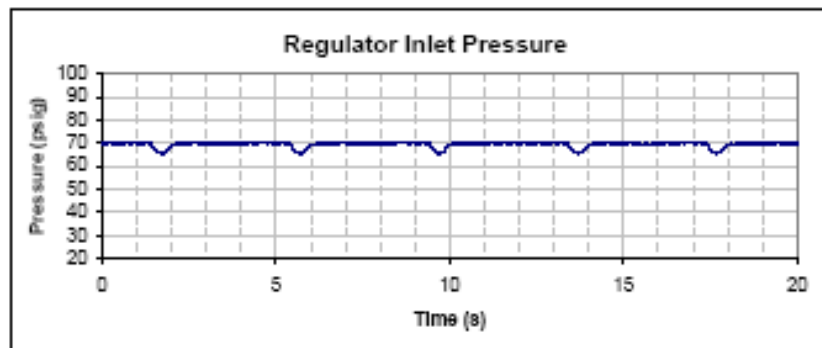
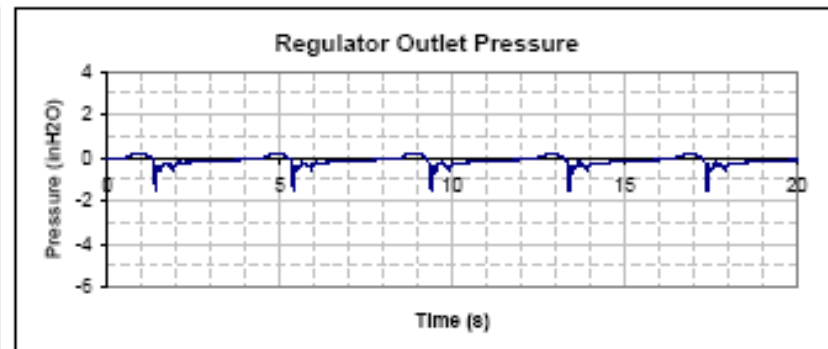
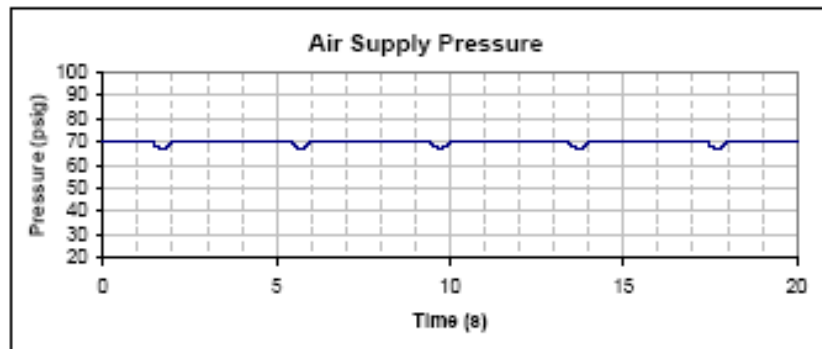
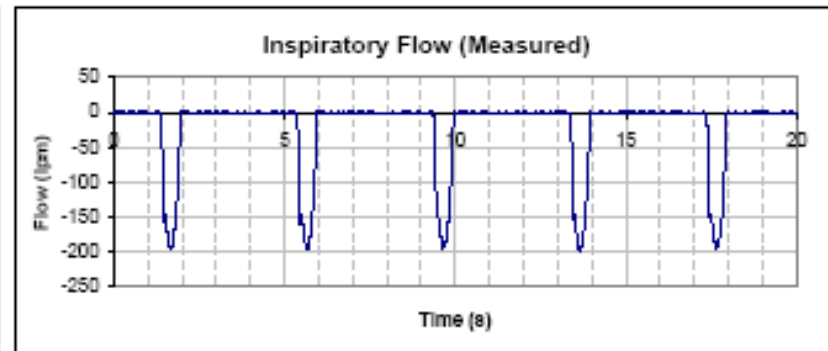
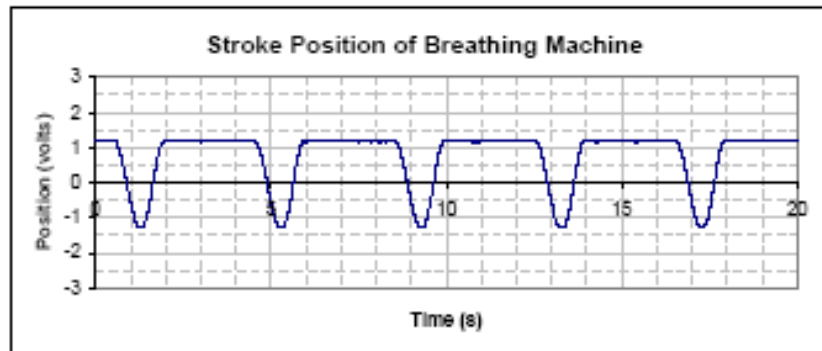
15

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Test #: 41

Settings

Breathing Rate (bpm) 15

Stroke Volume (l) 1.33

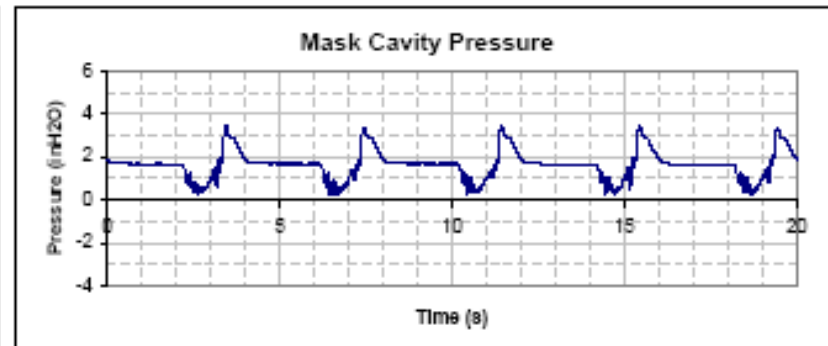
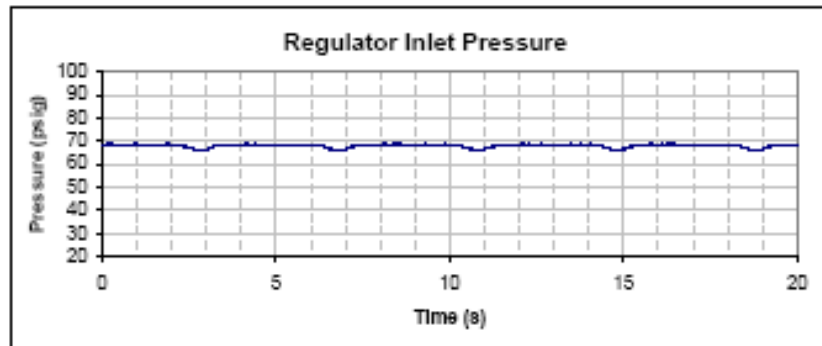
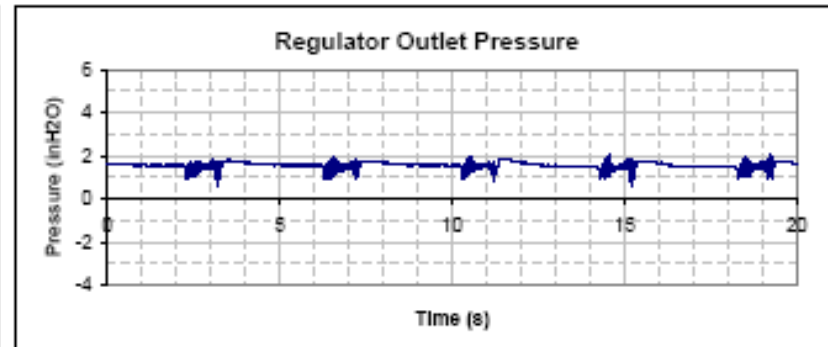
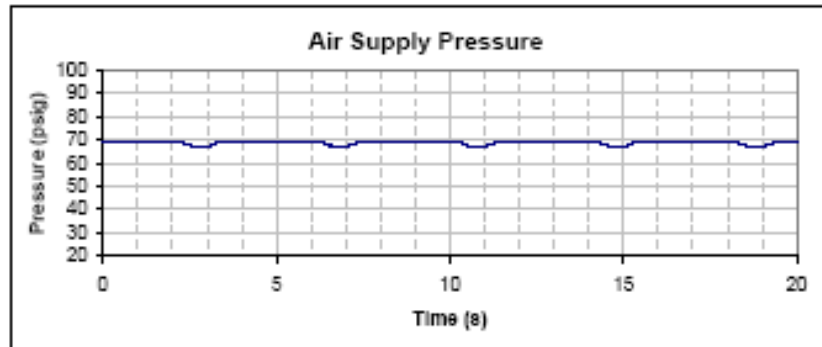
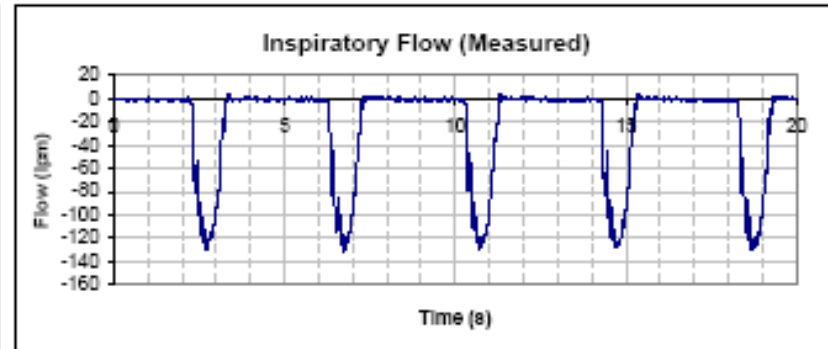
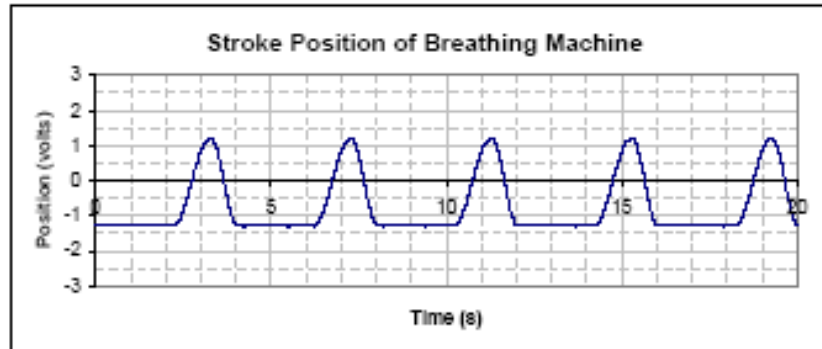
Minute Volume (l) 20

Peak Inspired Flow (lpm) 120

Altitude 30

Inlet Pressure (psig) 70

Regulator Mode Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

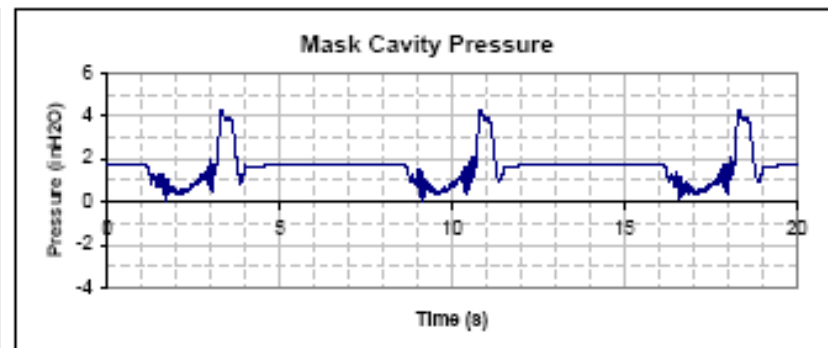
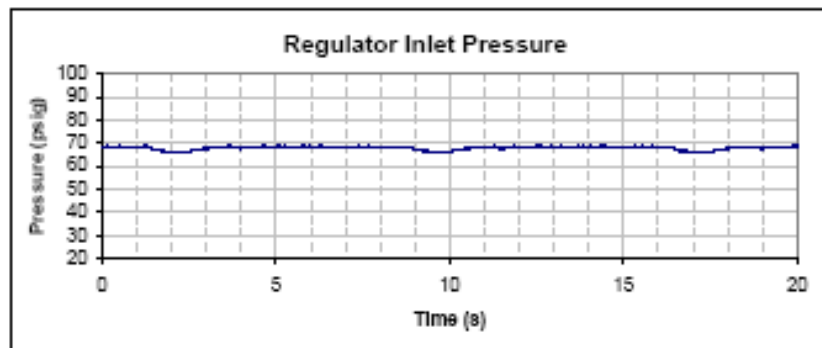
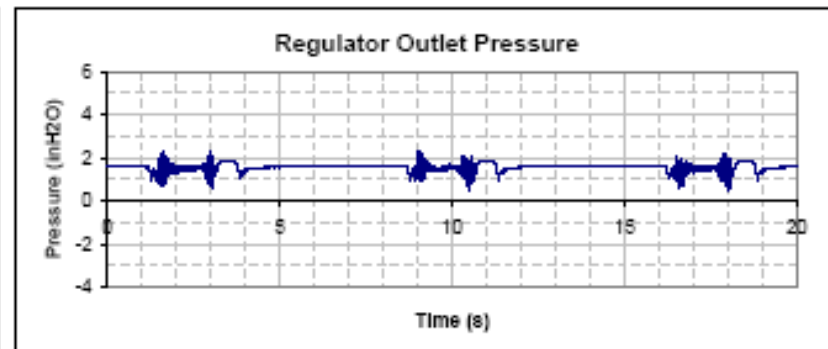
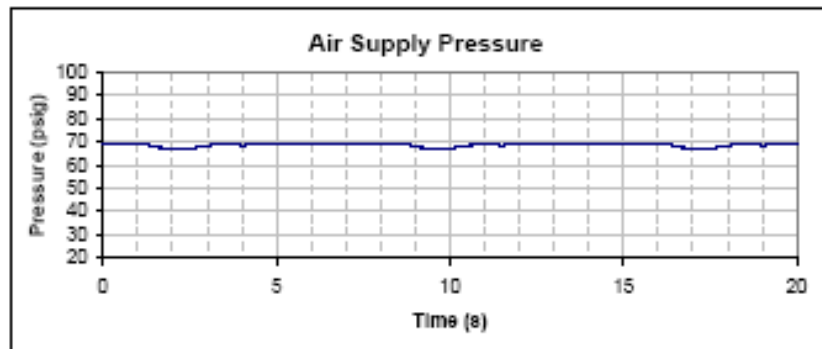
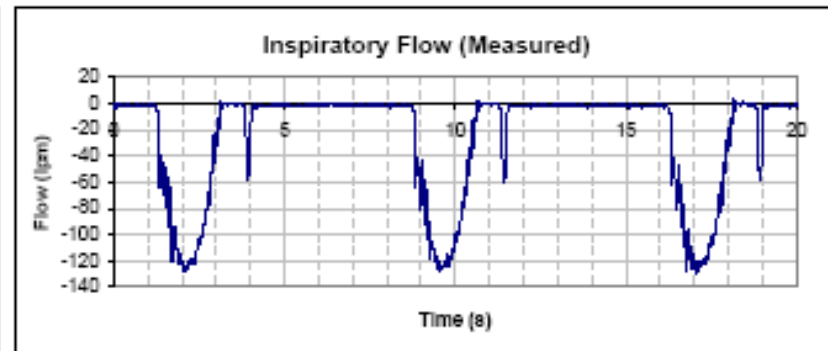
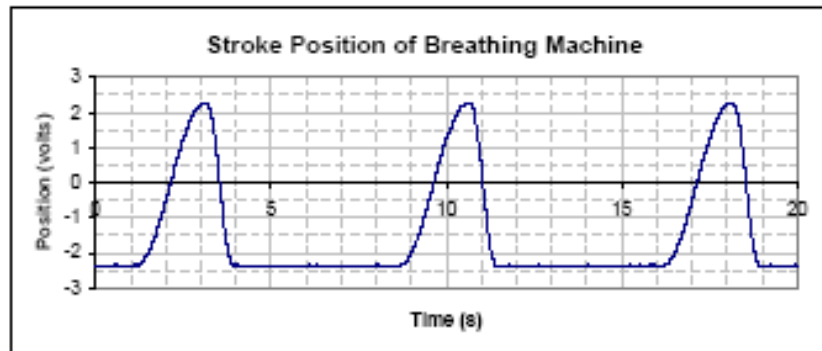
Test #: 42

Settings

Breathing Rate (bpm) 8  
Stroke Volume (l) 2.5

Minute Volume (l) 20  
Peak Inspired Flow (lpm) 120

Altitude 30  
Inlet Pressure (psig) 70  
Regulator Mode Dilution





CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Test #: 43

Settings

Breathing Rate (bpm)

22

Stroke Volume (l)

0.91

Minute Volume (l)

20

Peak Inspired Flow (lpm)

120

Altitude

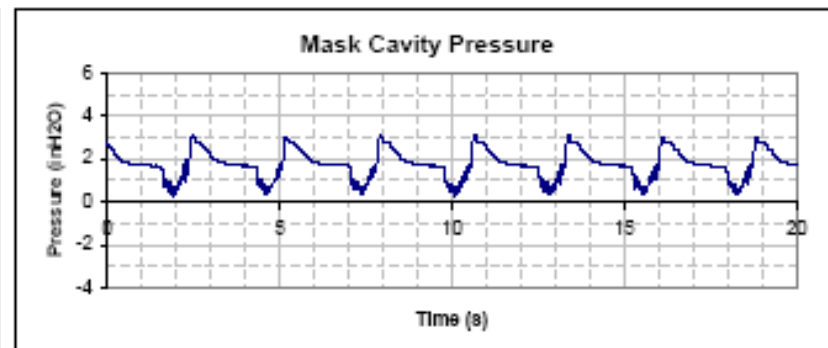
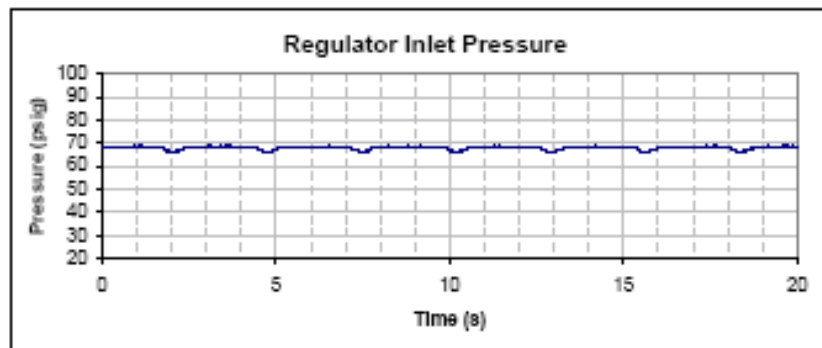
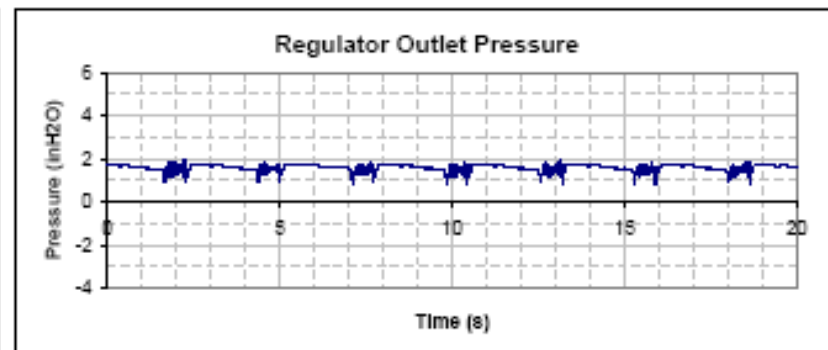
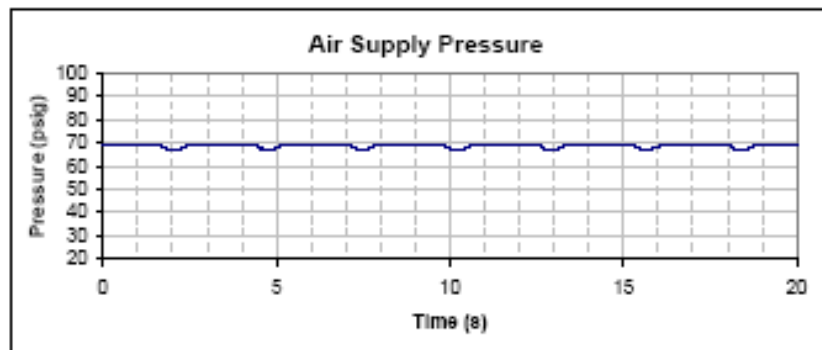
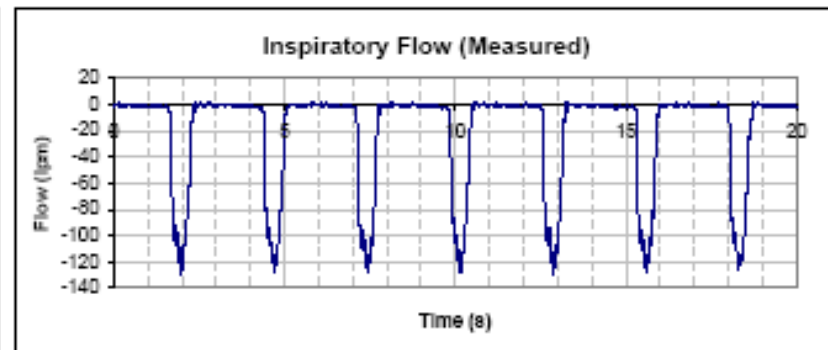
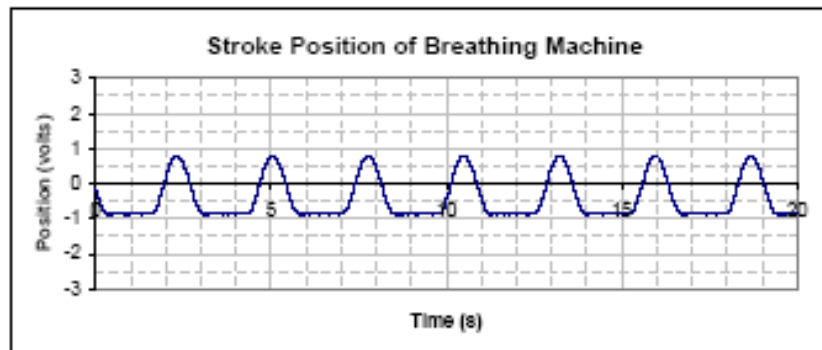
30

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 44

Breathing Rate (bpm)

15

Stroke Volume (l)

0.33

Minute Volume (l)

5

Peak Inspired Flow (lpm)

30

Altitude

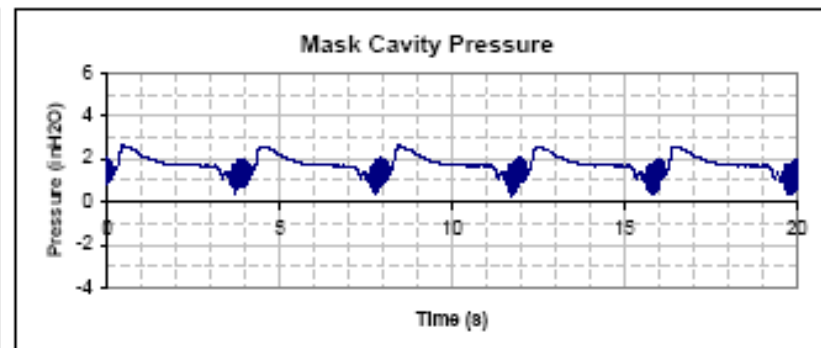
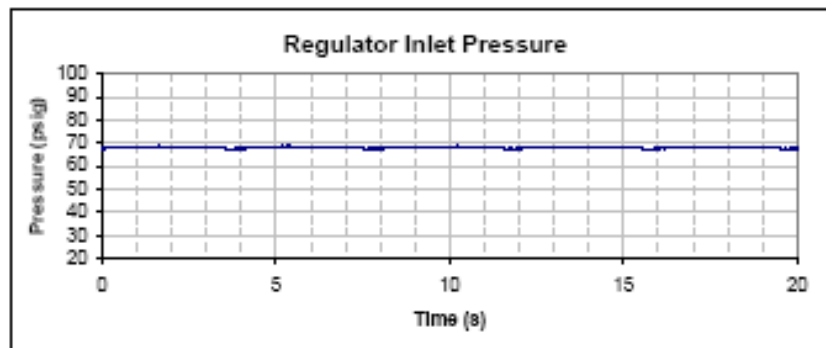
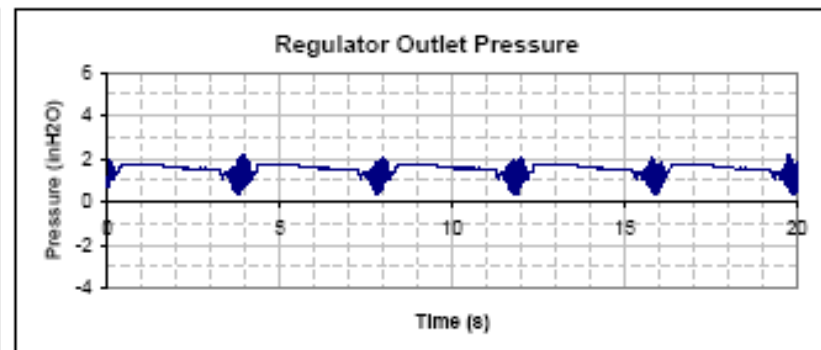
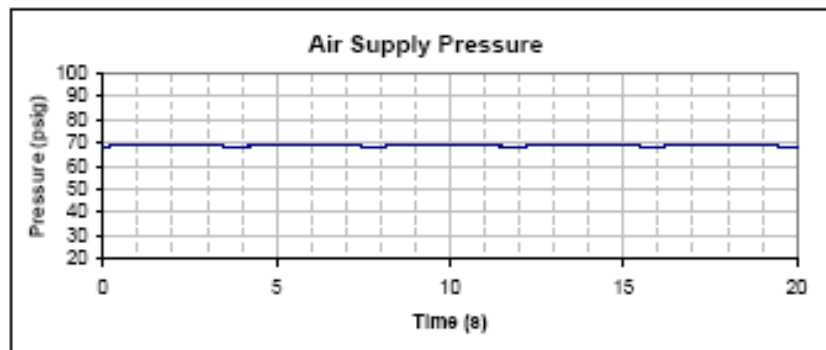
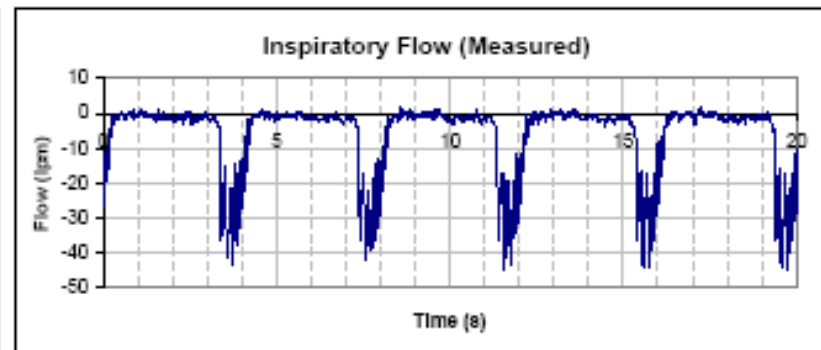
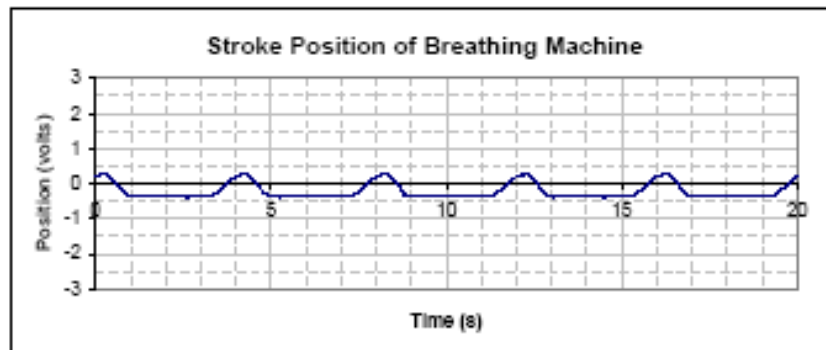
30

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 45

Breathing Rate (bpm)

15

Stroke Volume (l)

2.5

Minute Volume (l)

37.5

Peak Inspired Flow (lpm)

250

Altitude

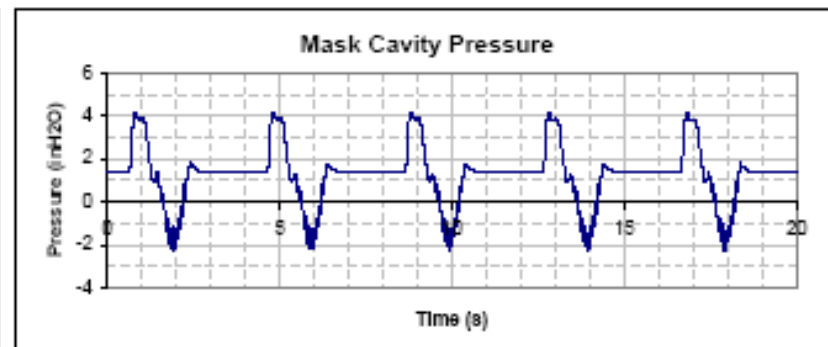
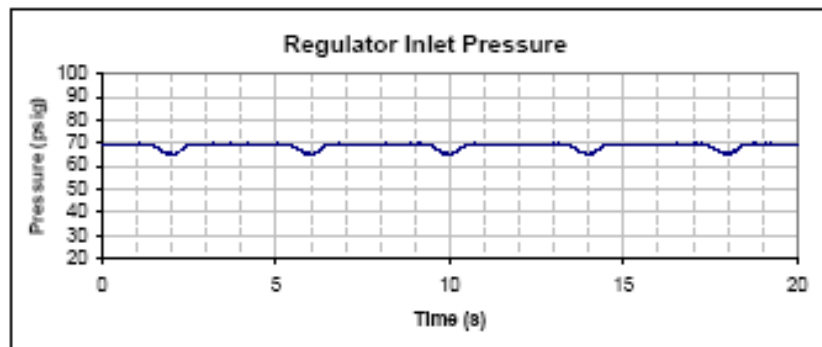
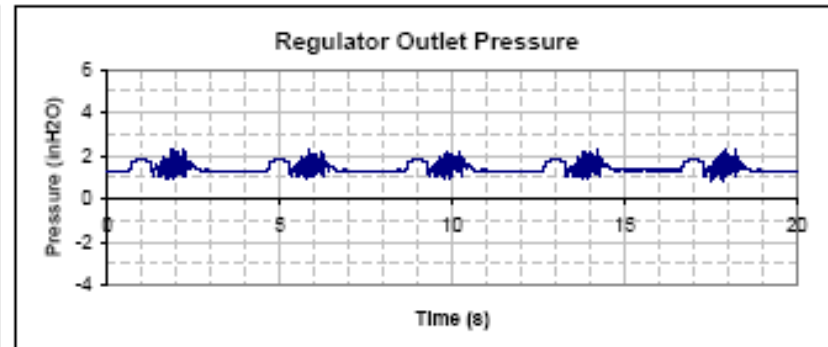
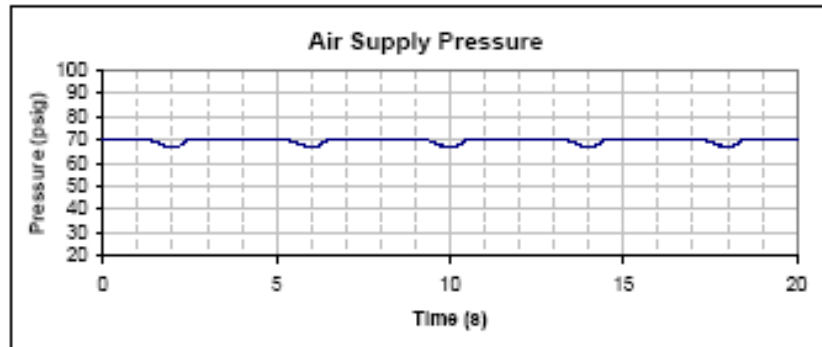
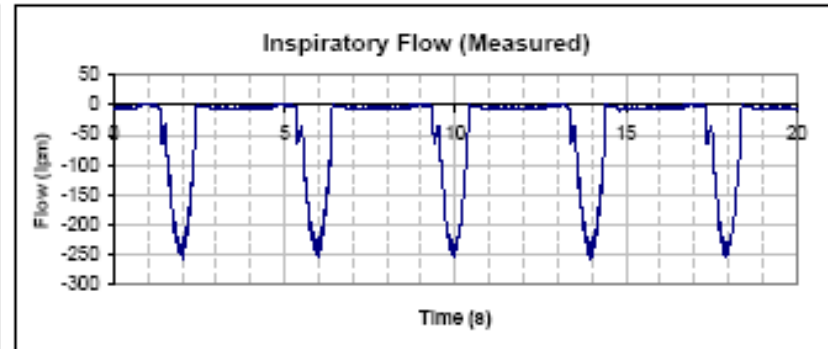
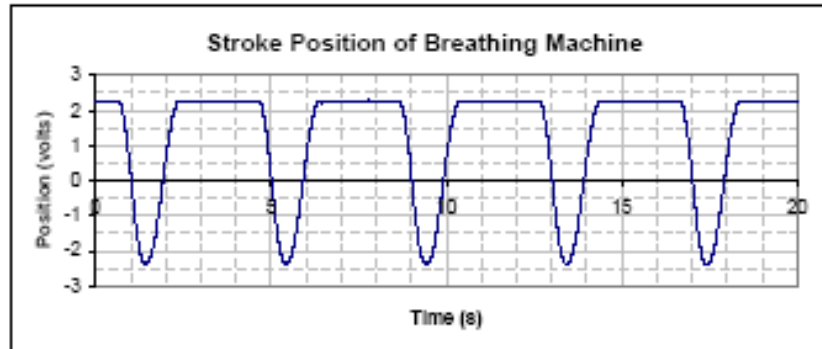
30

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 4 - Varied Altitude

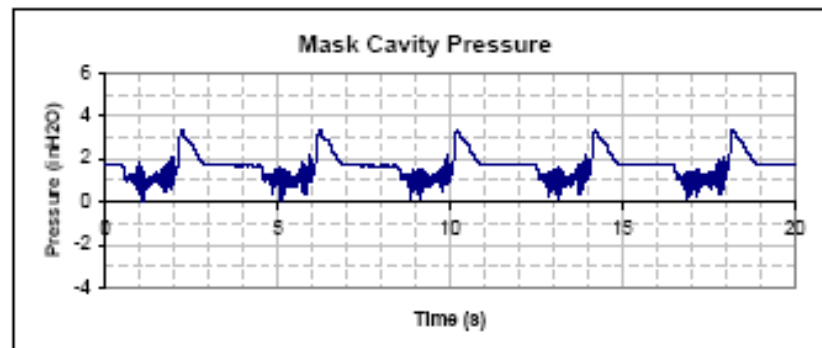
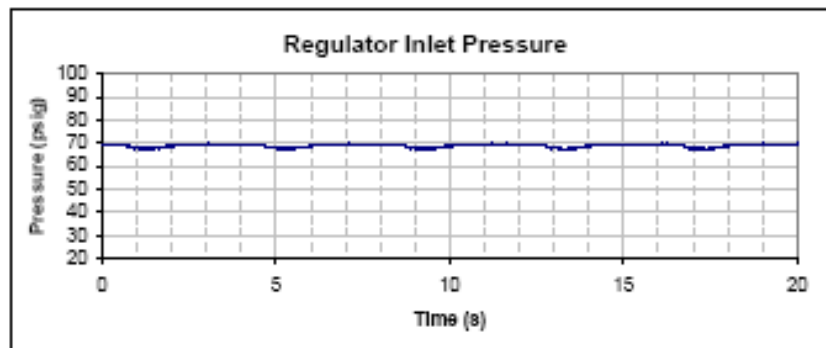
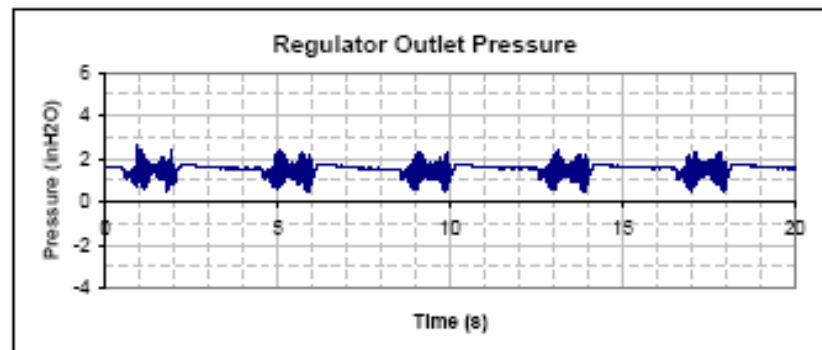
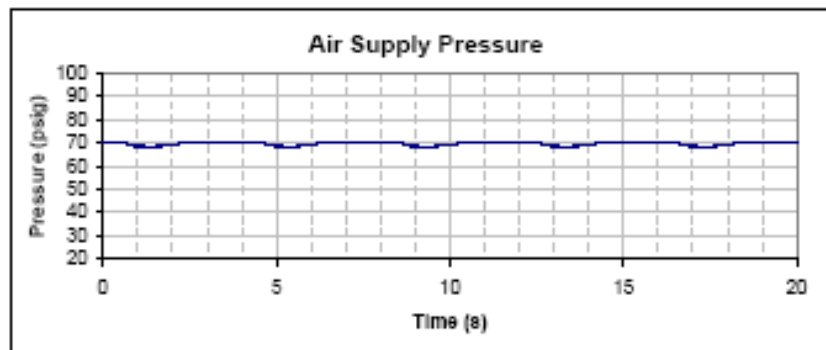
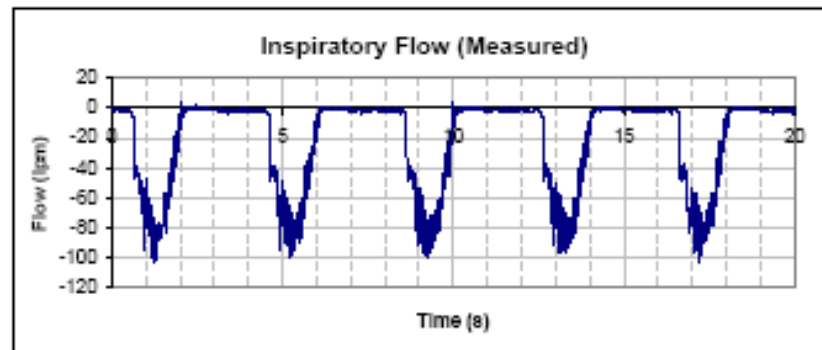
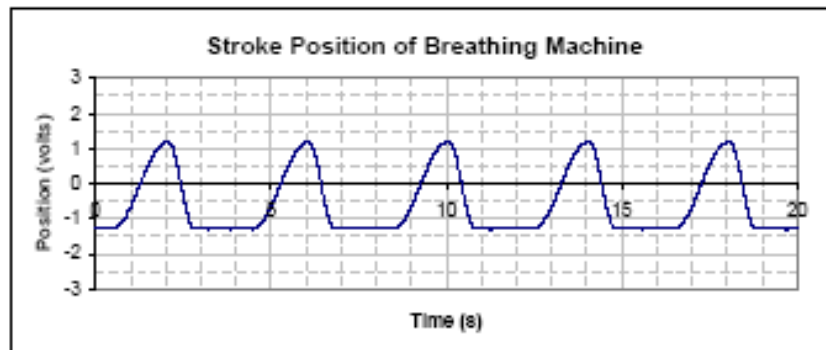
Test #: 46

Settings

Breathing Rate (bpm) 15  
Stroke Volume (l) 1.33

Minute Volume (l) 20  
Peak Inspired Flow (lpm) 80

Altitude 30  
Inlet Pressure (psig) 70  
Regulator Mode Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Test #: 47

Settings

Breathing Rate (bpm) 15

Stroke Volume (l) 1.33

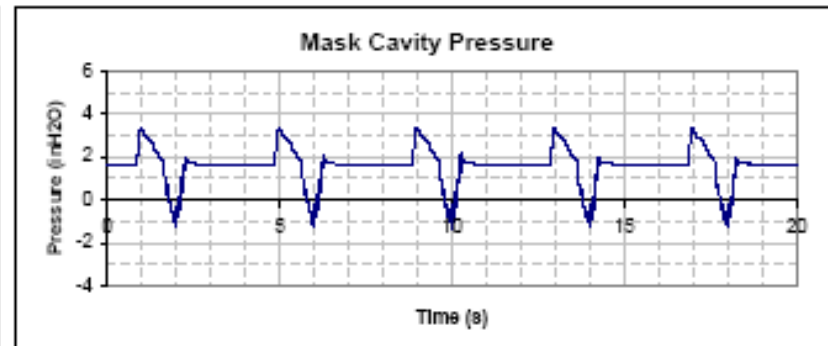
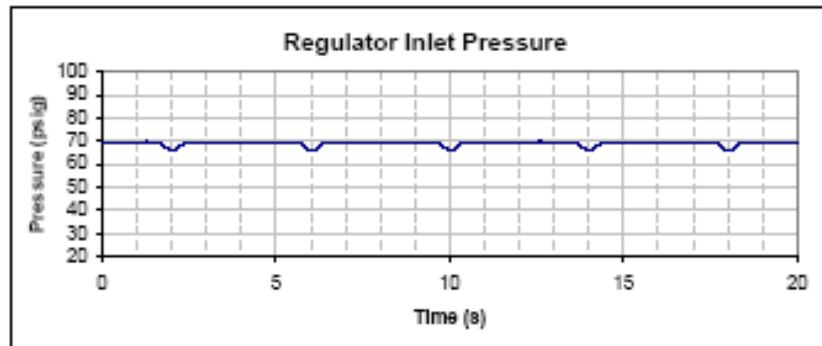
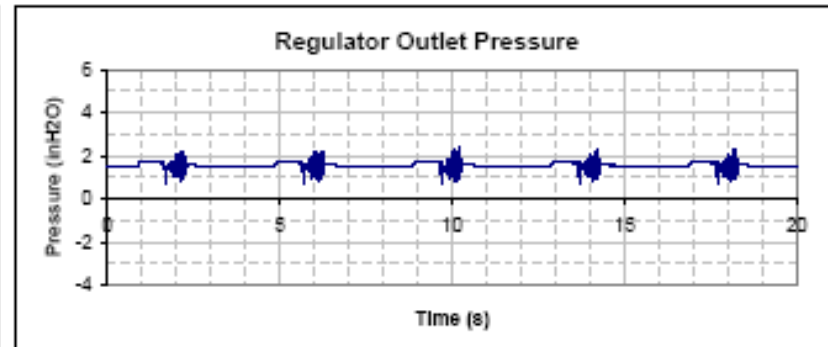
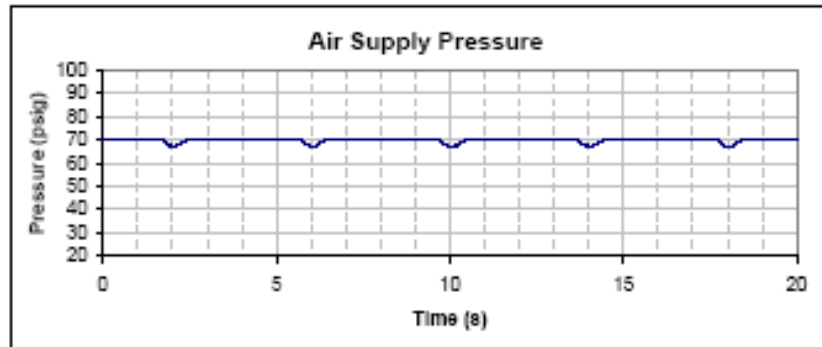
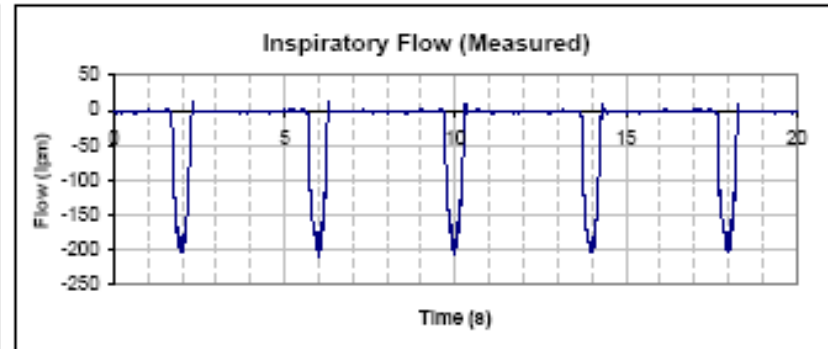
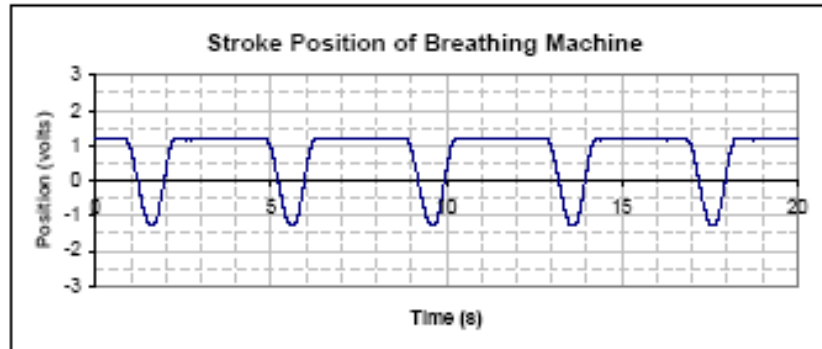
Minute Volume (l) 20

Peak Inspired Flow (lpm) 200

Altitude 30

Inlet Pressure (psig) 70

Regulator Mode Dilution



CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 4 - Varied Altitude

Test #: 48

Settings

Breathing Rate (bpm) 15

Stroke Volume (l) 1.33

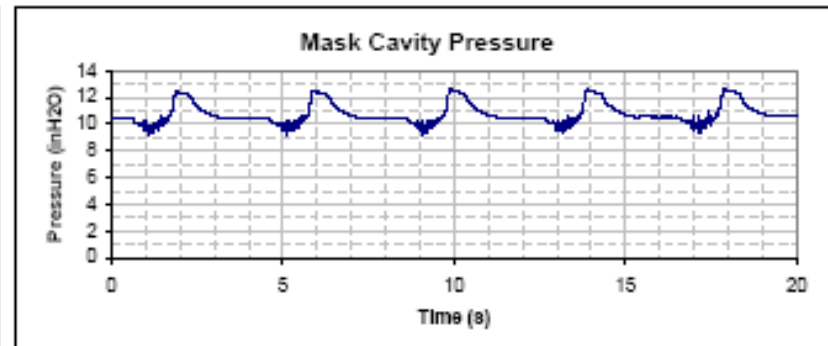
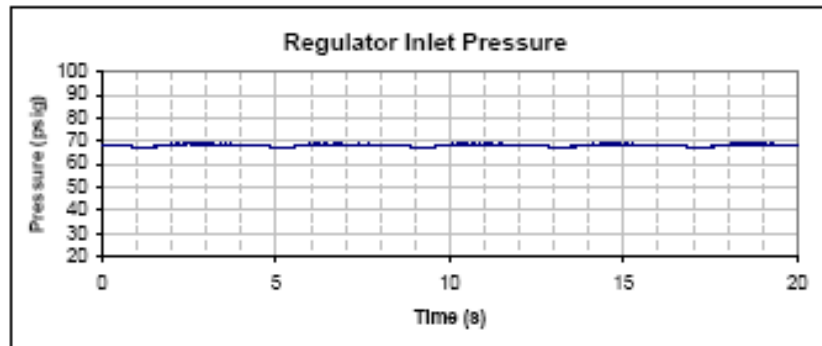
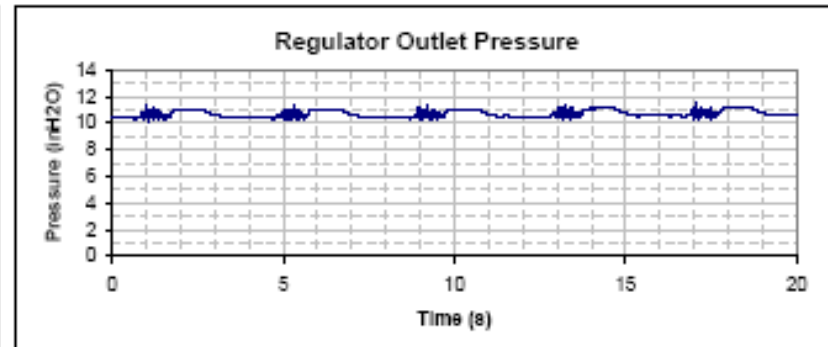
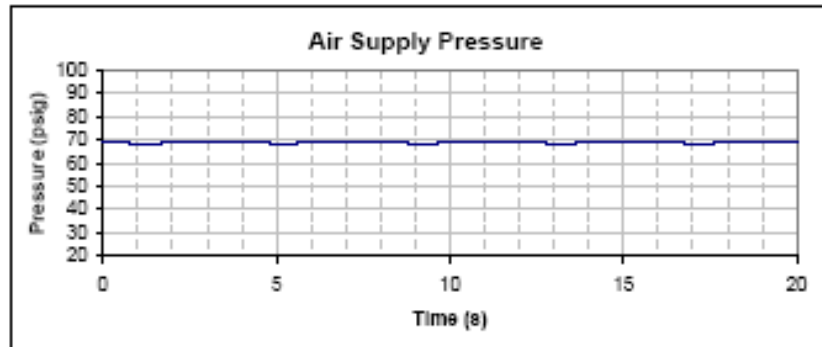
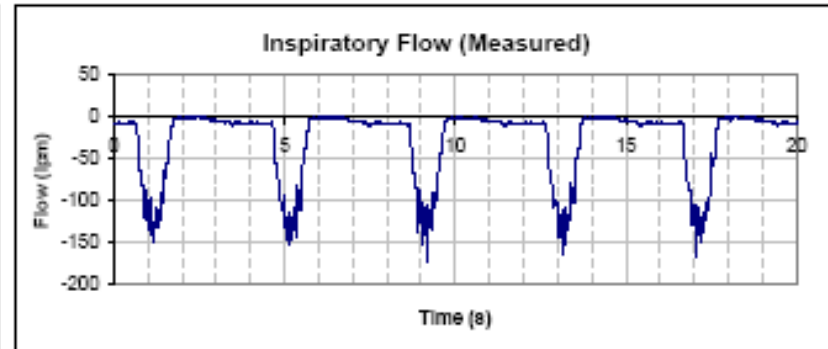
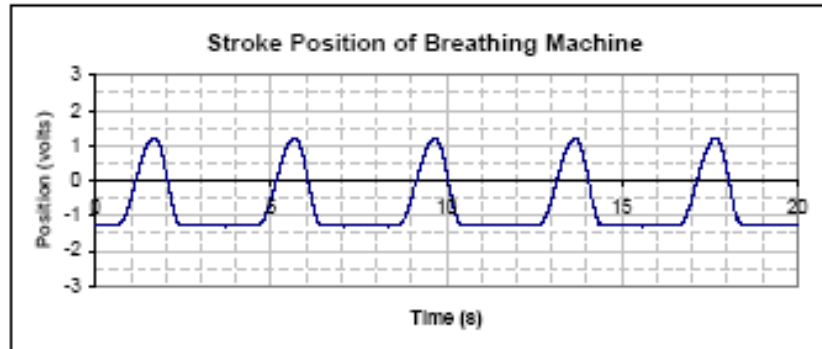
Minute Volume (l) 20

Peak Inspired Flow (lpm) 120

Altitude 45

Inlet Pressure (psig) 70

Regulator Mode Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 49

Breathing Rate (bpm)

8

Stroke Volume (l)

2.5

Minute Volume (l)

20

Peak Inspired Flow (lpm)

120

Altitude

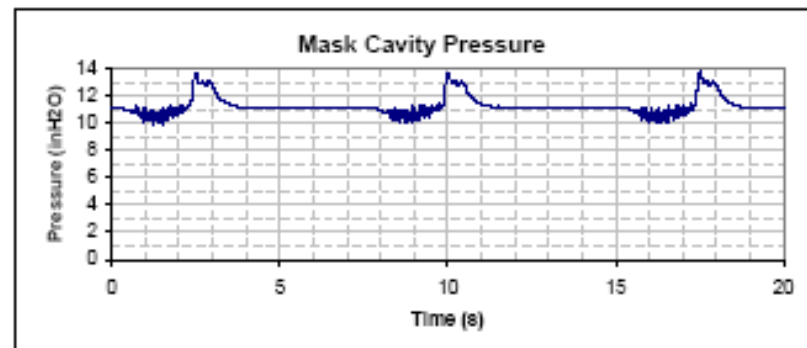
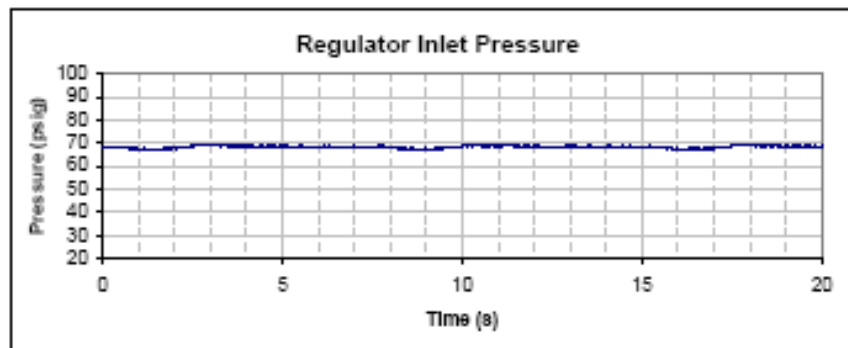
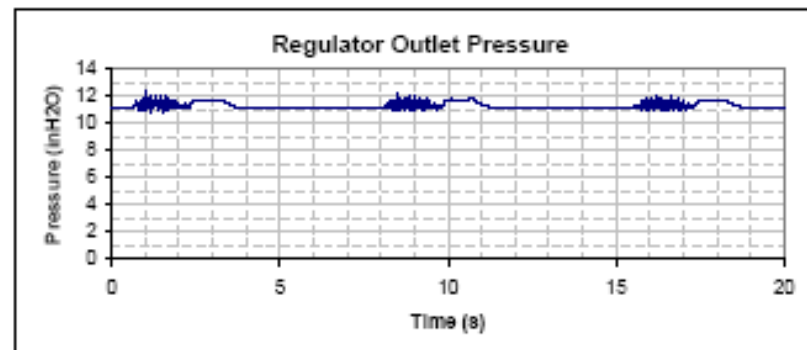
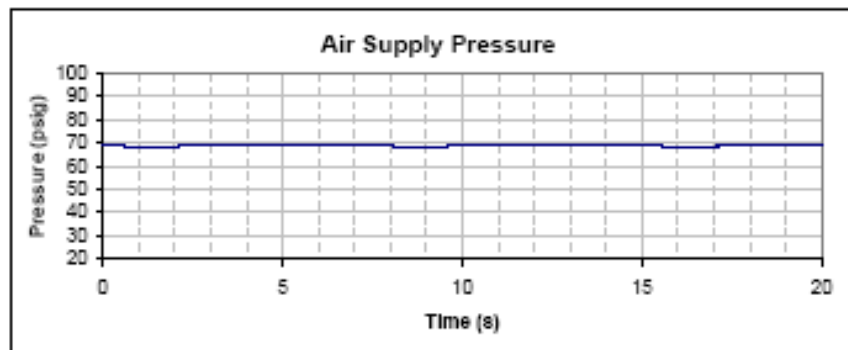
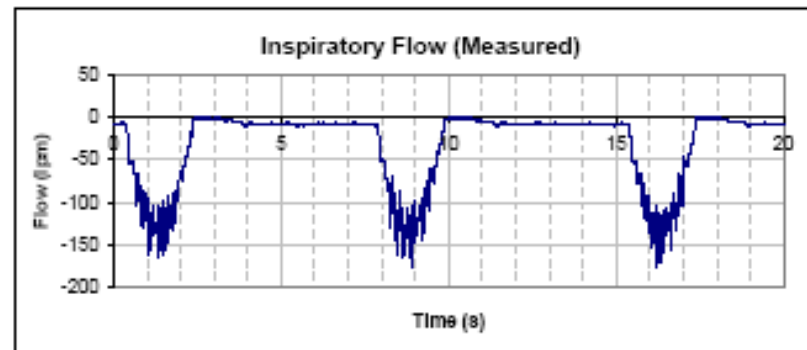
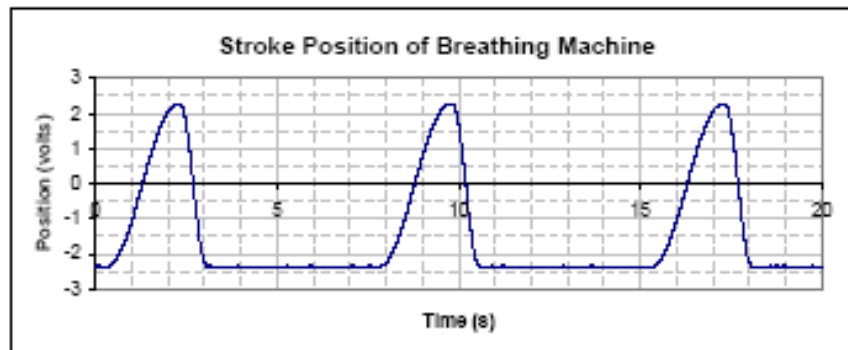
45

Inlet Pressure (psig)

70

Regulator Mode

Dilution



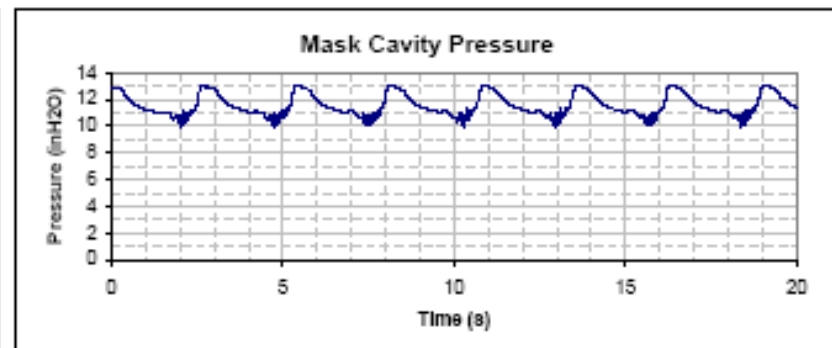
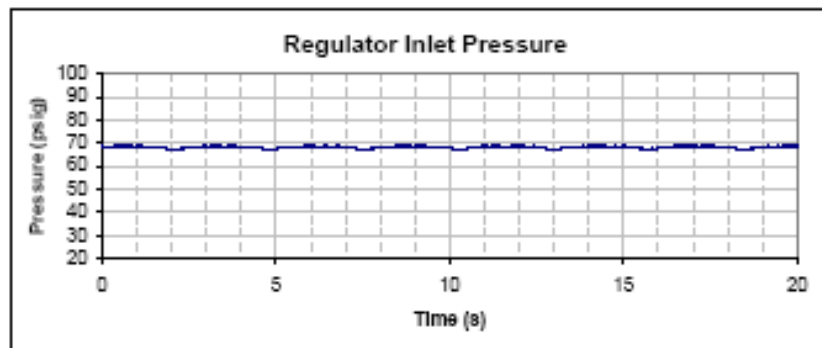
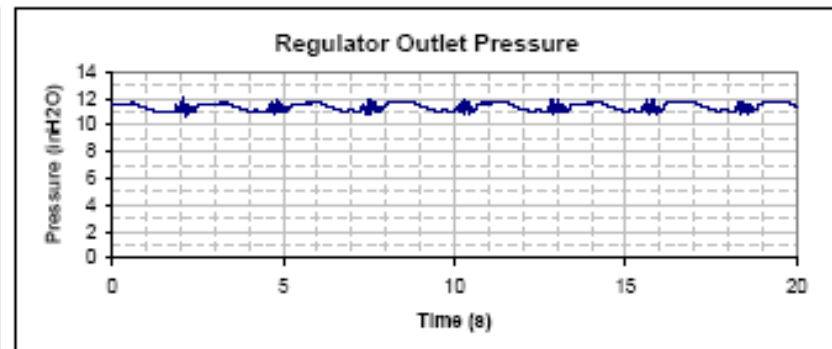
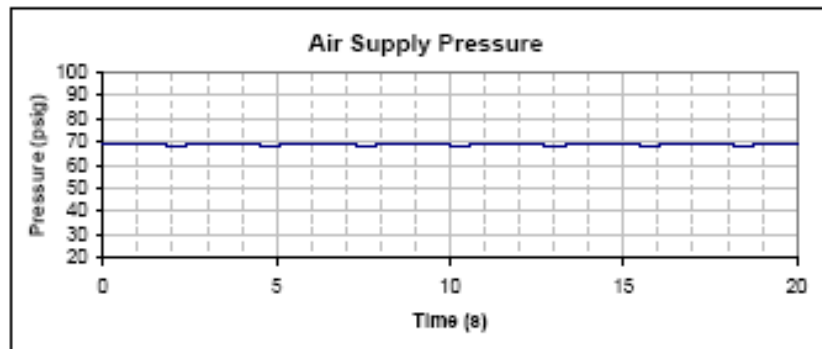
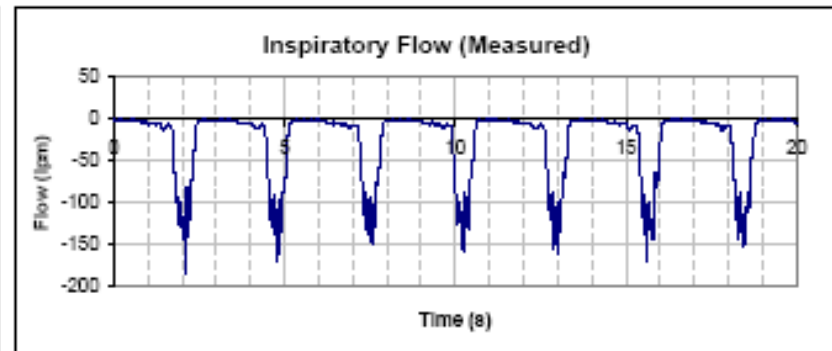
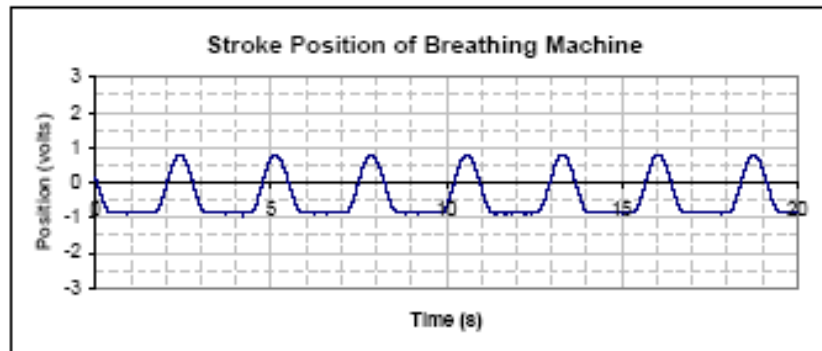
CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 50  
Breathing Rate (bpm) 22  
Stroke Volume (l) 0.91

Altitude 45  
Minute Volume (l) 20  
Inlet Pressure (psig) 70  
Peak Inspired Flow (lpm) 120  
Regulator Mode Dilution





CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 51

Breathing Rate (bpm)

15

Stroke Volume (l)

0.33

Minute Volume (l)

5

Peak Inspired Flow (lpm)

30

Altitude

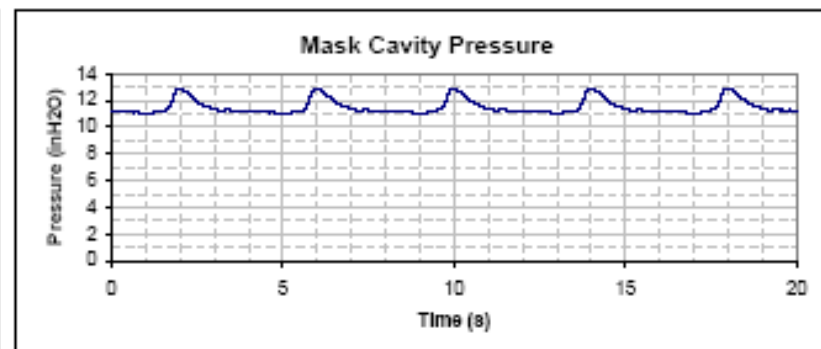
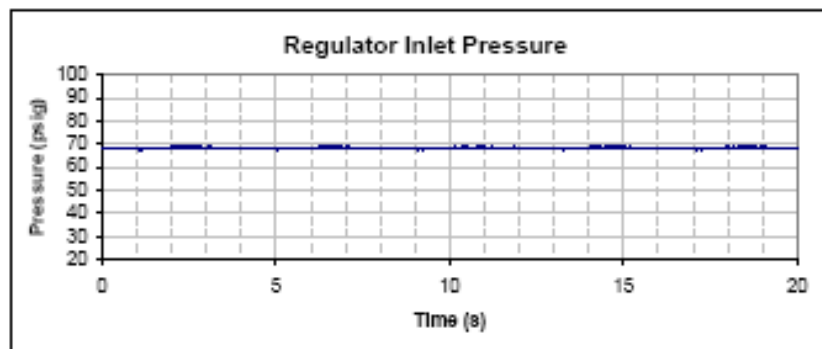
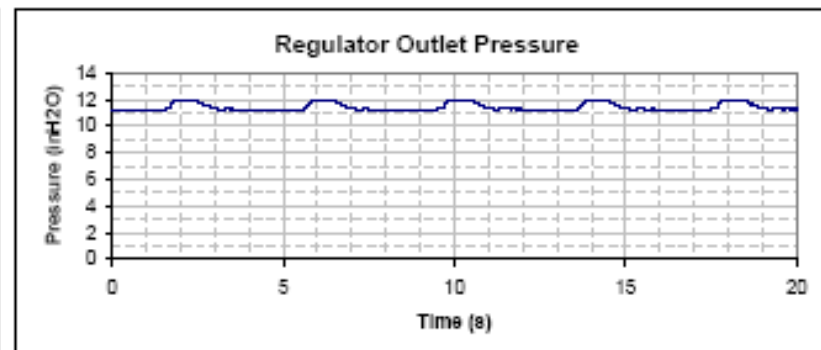
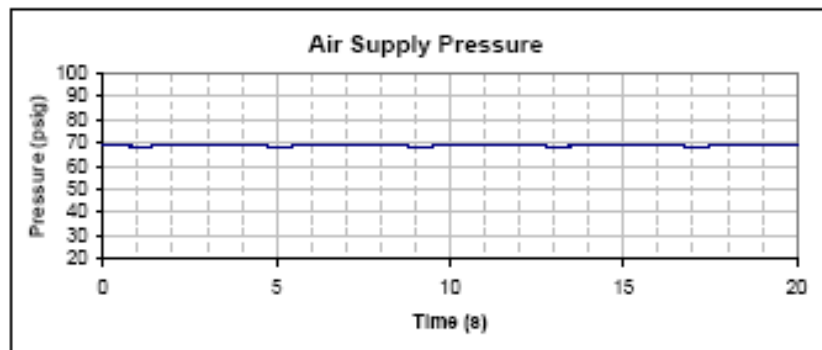
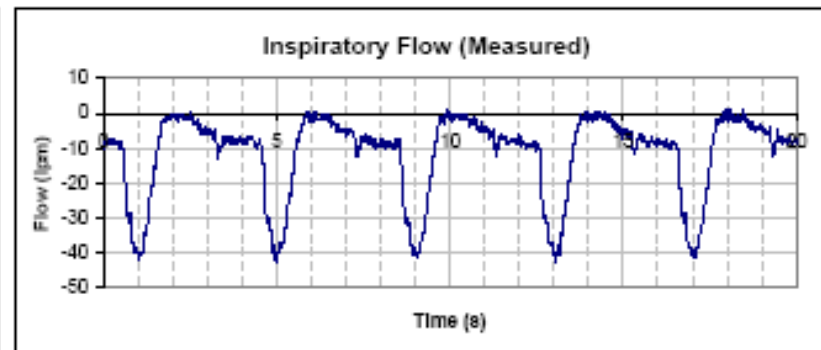
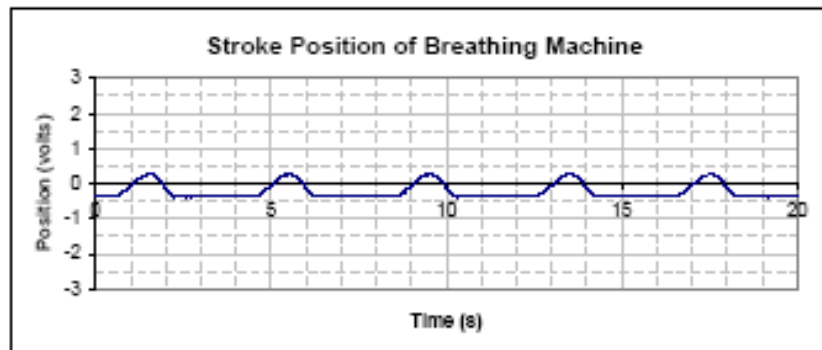
45

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 52

Breathing Rate (bpm)

15

Stroke Volume (l)

2.5

Minute Volume (l)

37.5

Peak Inspired Flow (lpm)

250

Altitude

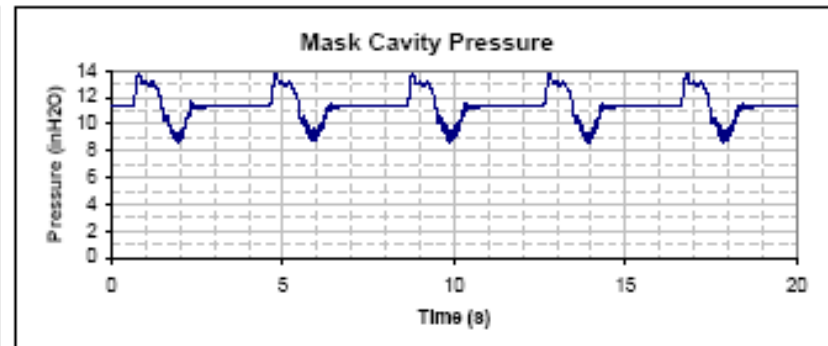
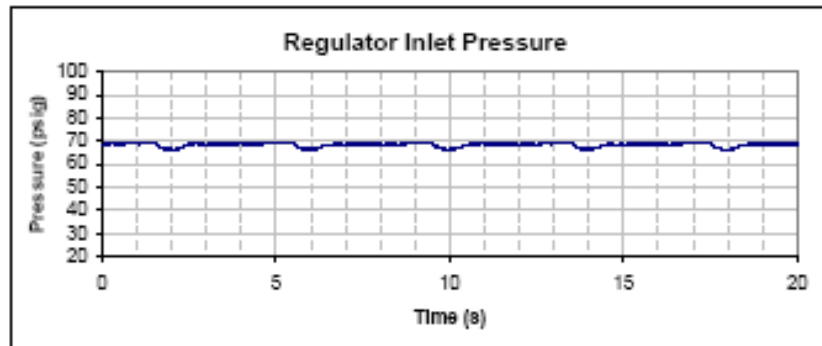
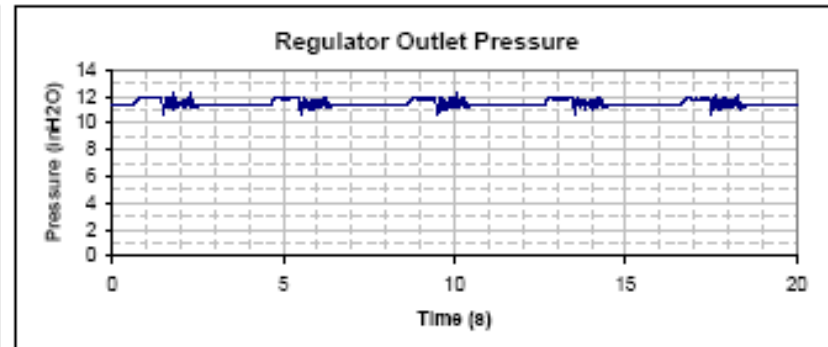
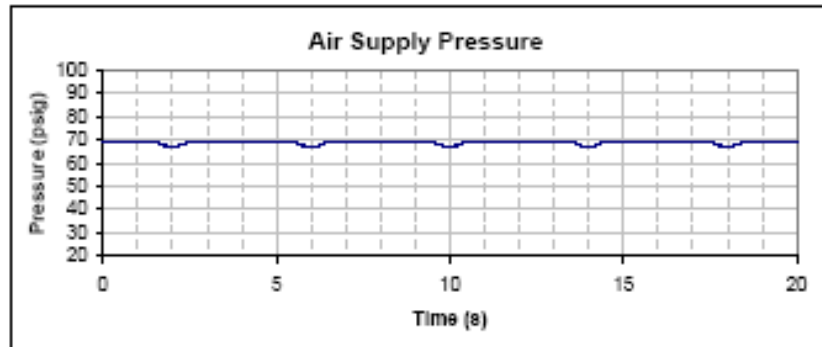
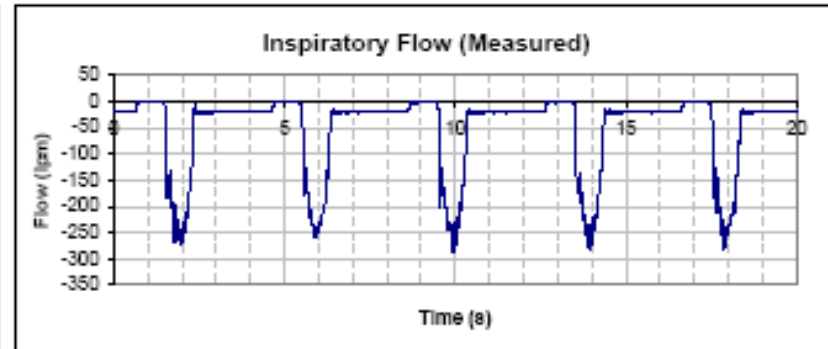
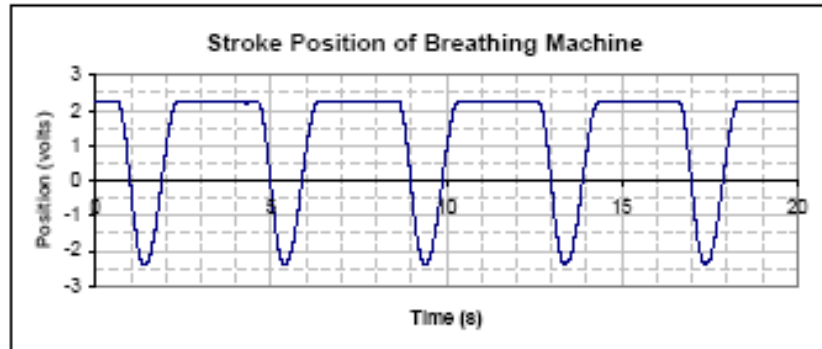
45

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 53

Breathing Rate (bpm)

15

Stroke Volume (l)

1.33

Minute Volume (l)

20

Peak Inspired Flow (lpm)

80

Altitude

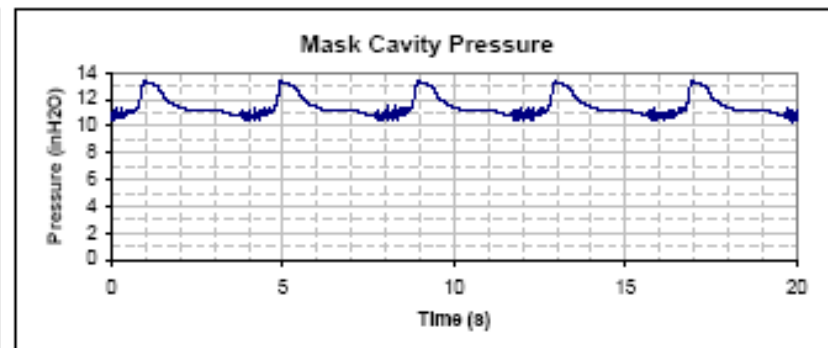
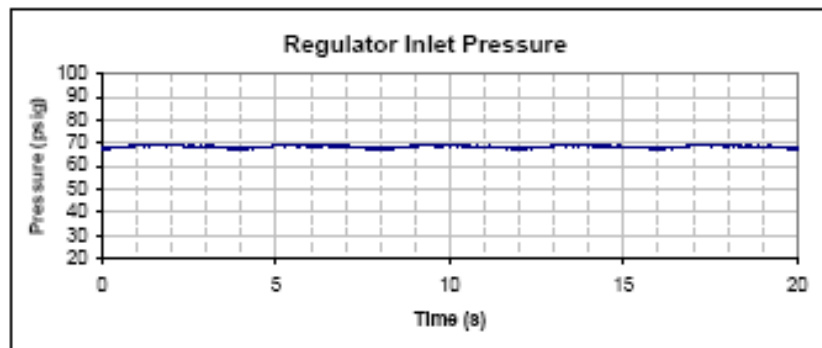
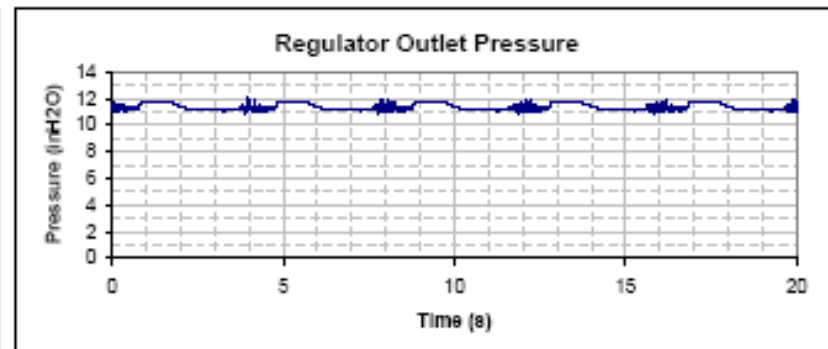
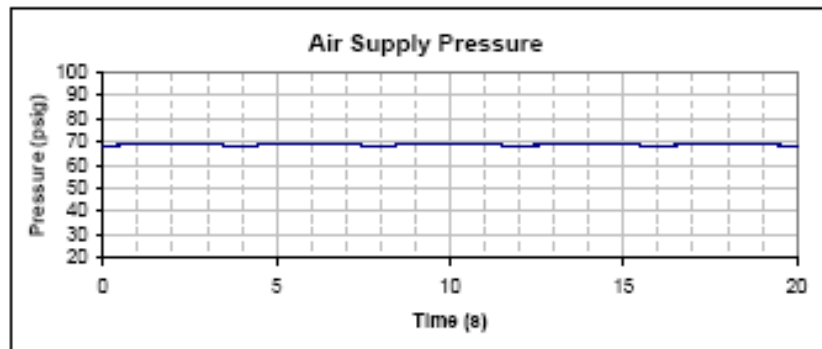
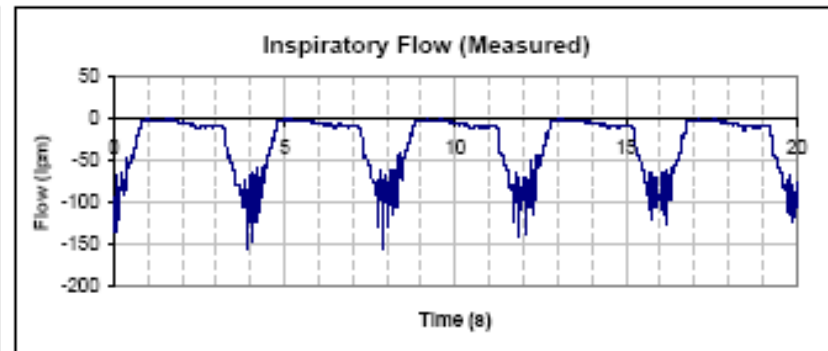
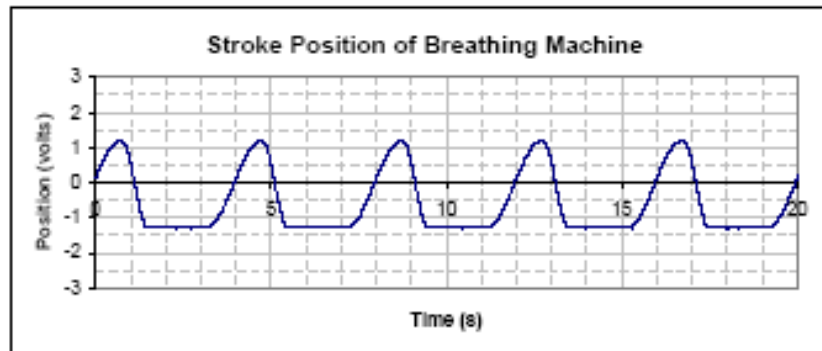
45

Inlet Pressure (psig)

70

Regulator Mode

Dilution



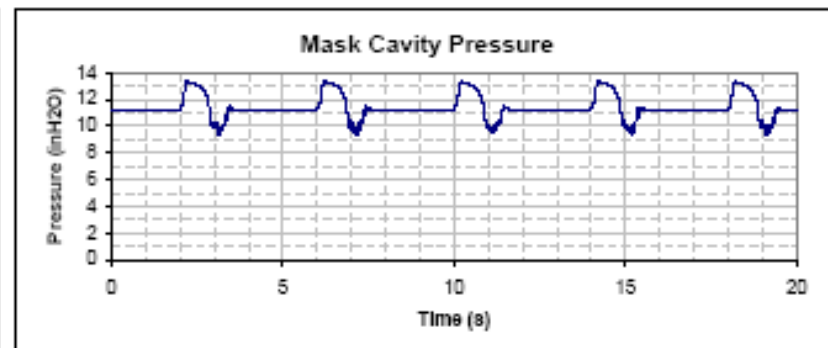
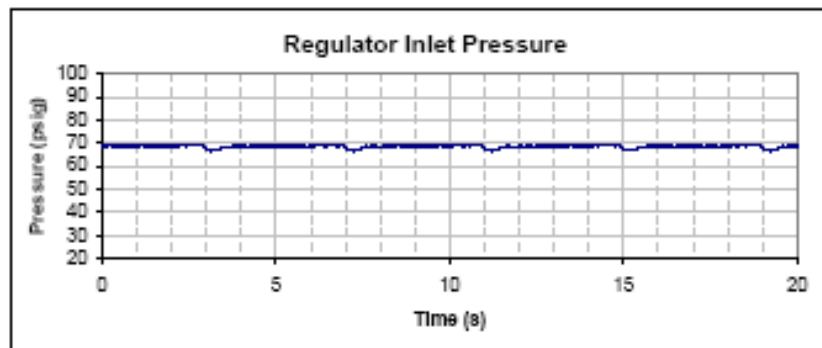
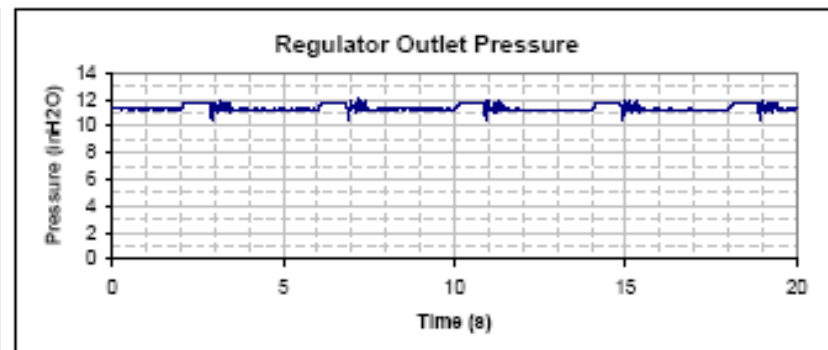
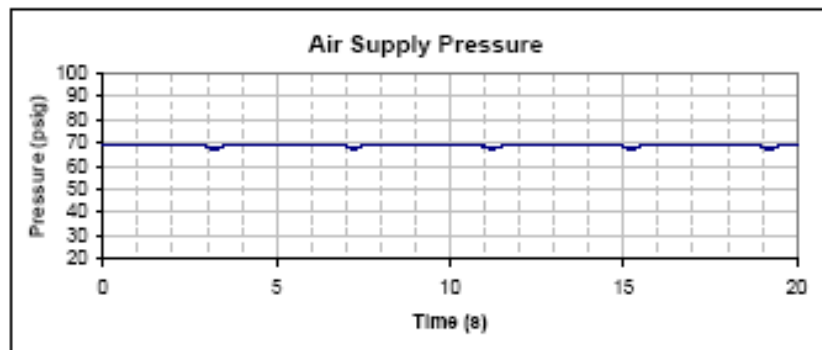
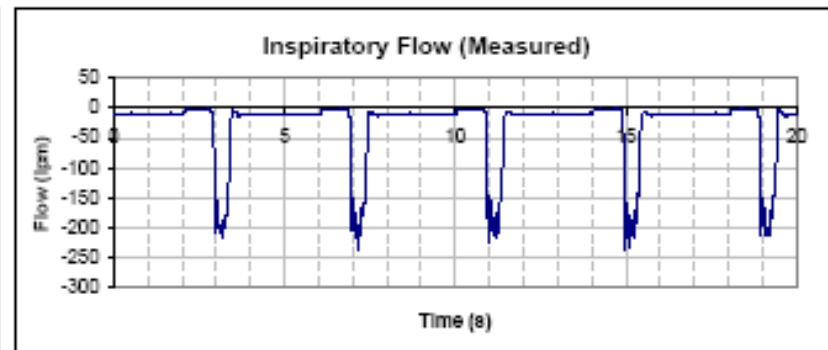
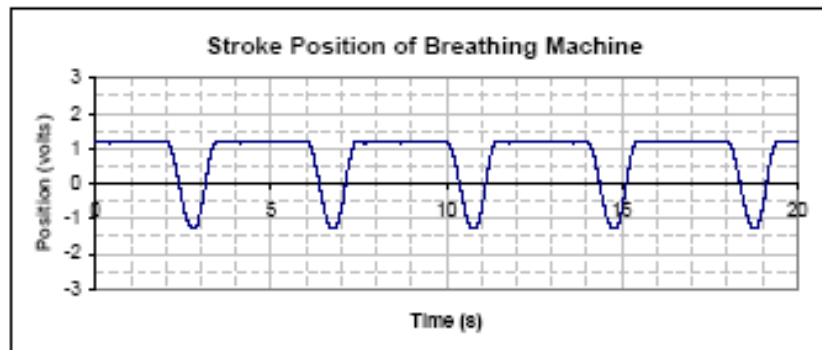
CF188 Oxygen System Compatability Test - NACES Configuration

Group: 4 - Varied Altitude

Settings

Test #: 54  
Breathing Rate (bpm) 15  
Stroke Volume (l) 1.33

Altitude 45  
Minute Volume (l) 20  
Inlet Pressure (psig) 70  
Peak Inspired Flow (lpm) 200  
Regulator Mode Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 55

Breathing Rate (bpm)

8

Stroke Volume (l)

0.625

Minute Volume (l)

5

Peak Inspired Flow (lpm)

50

Altitude

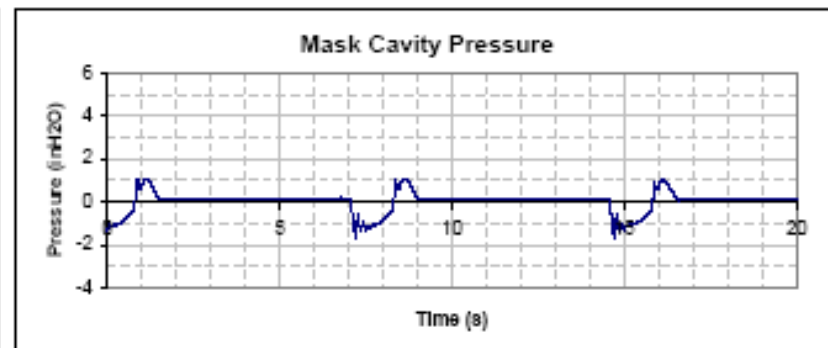
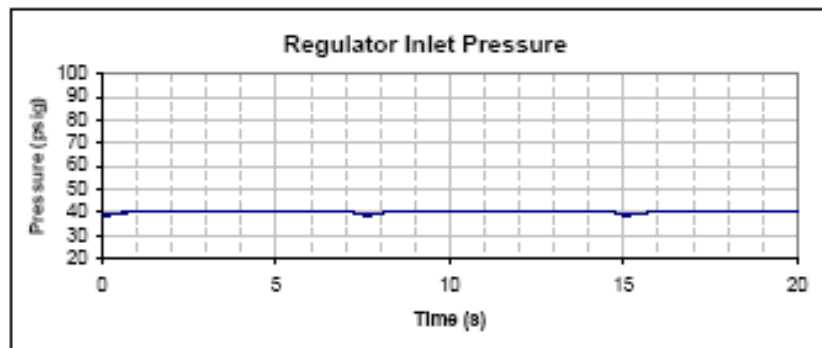
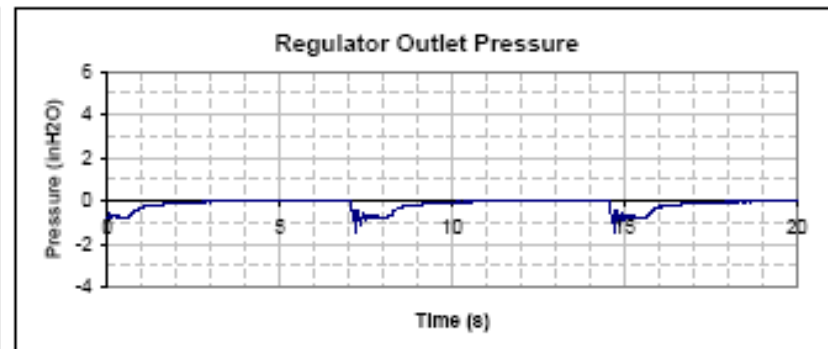
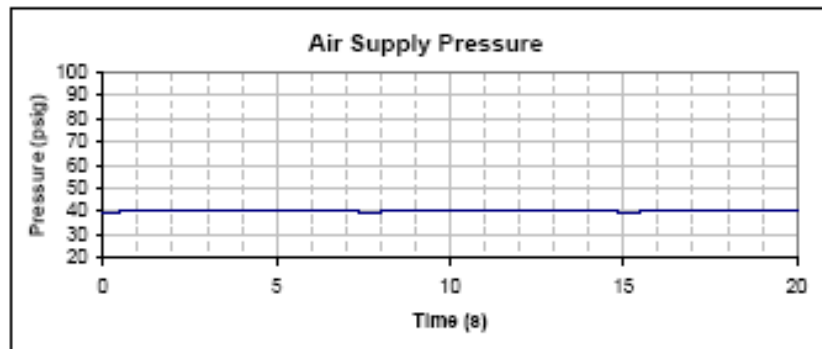
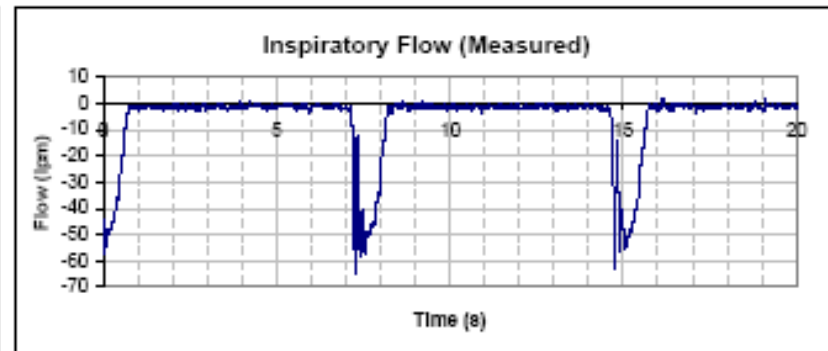
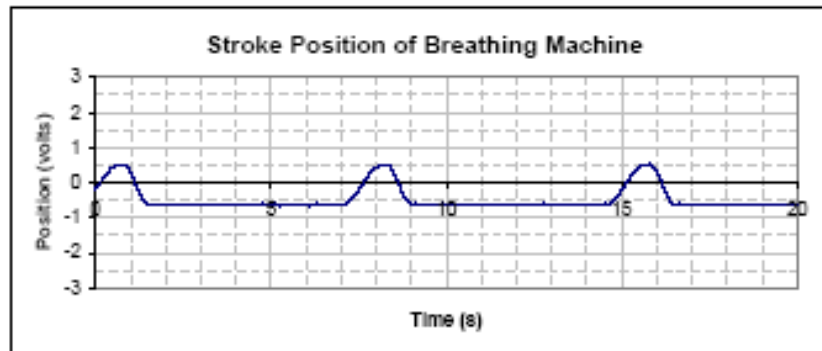
7.5

Inlet Pressure (psig)

40

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 56

Breathing Rate (bpm)

8

Stroke Volume (l)

2.5

Minute Volume (l)

20

Peak Inspired Flow (lpm)

200

Altitude

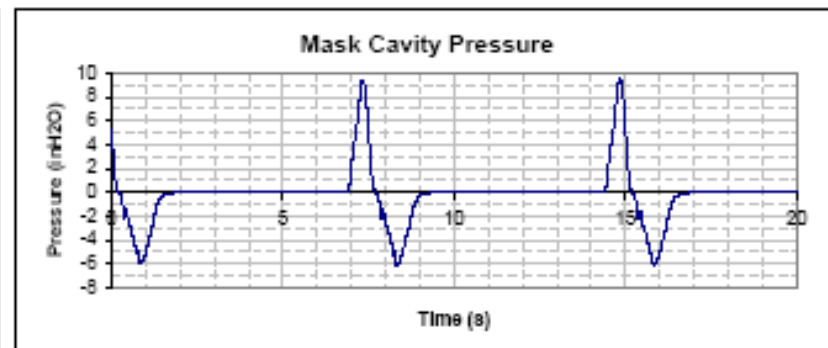
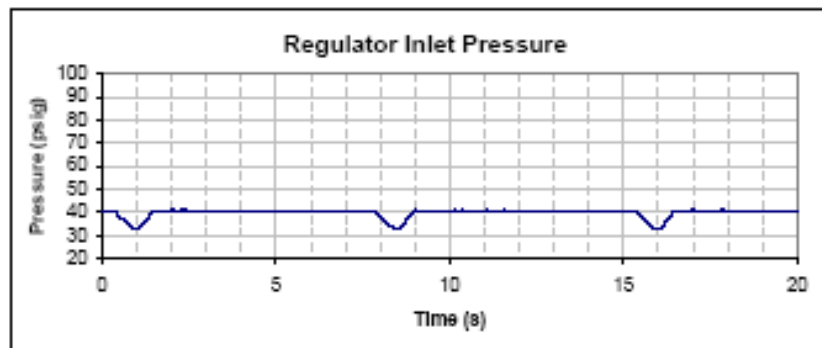
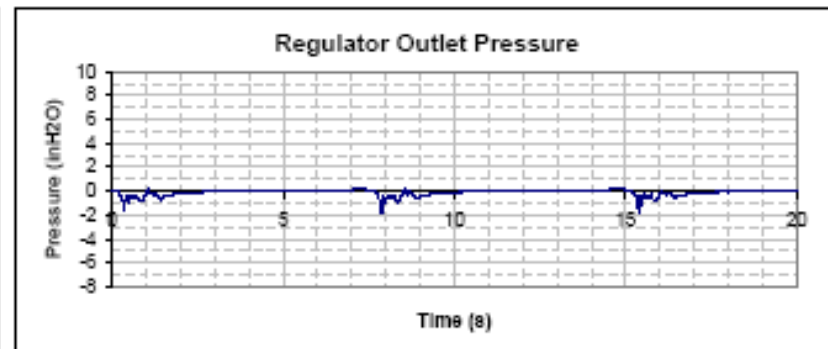
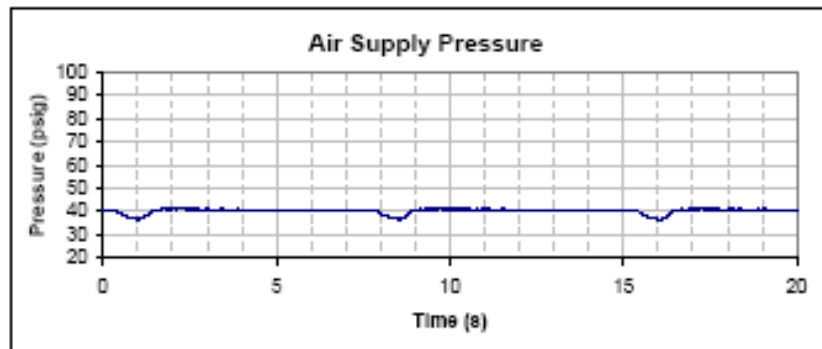
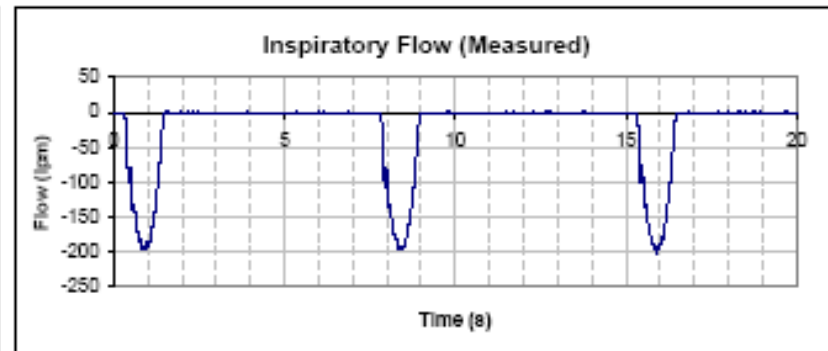
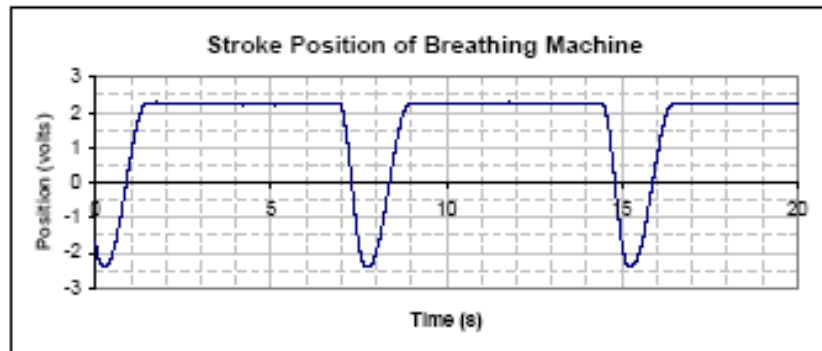
7.5

Inlet Pressure (psig)

40

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 57

Breathing Rate (bpm)

22

Stroke Volume (l)

0.23

Minute Volume (l)

5

Peak Inspired Flow (lpm)

50

Altitude

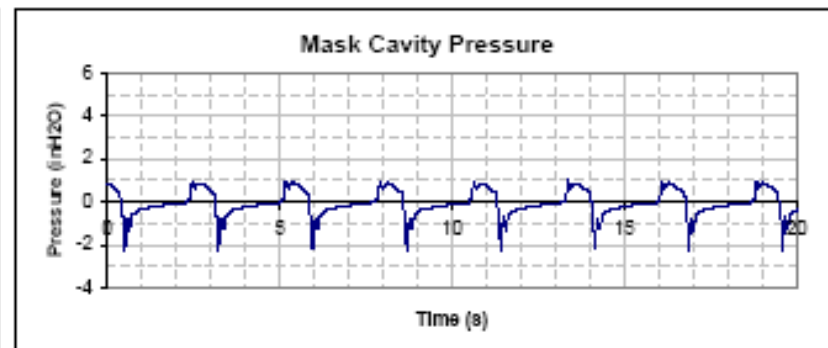
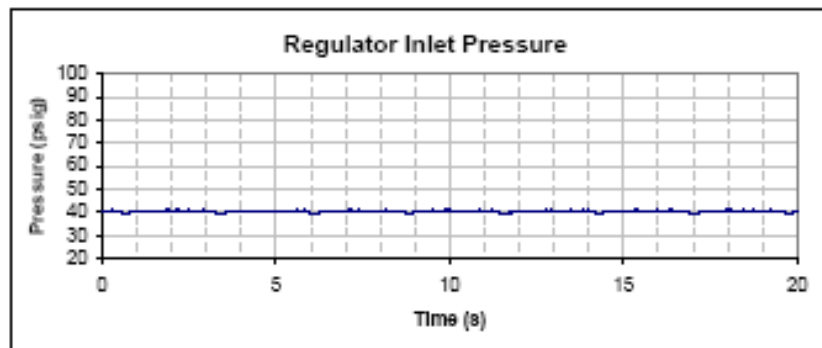
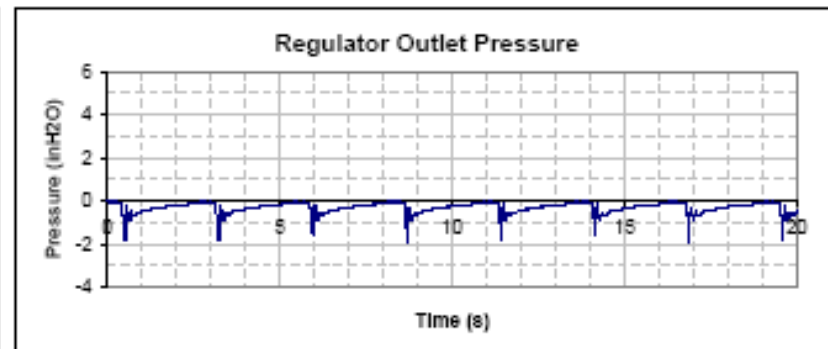
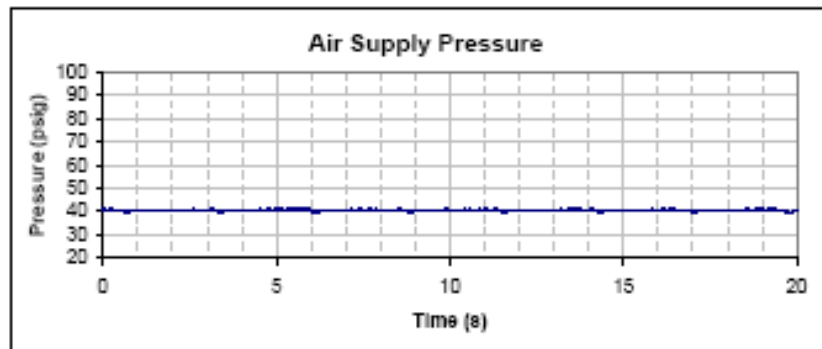
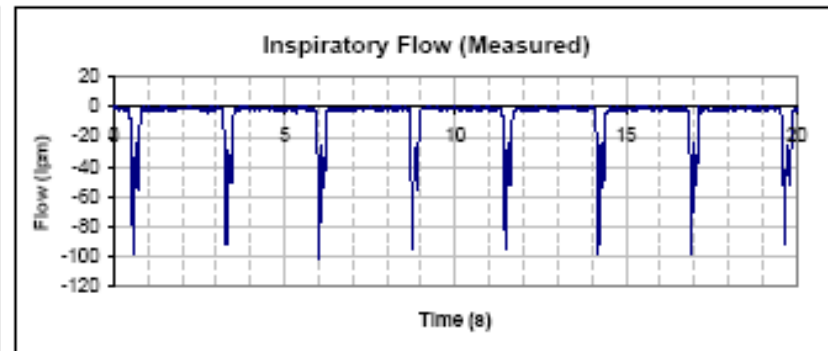
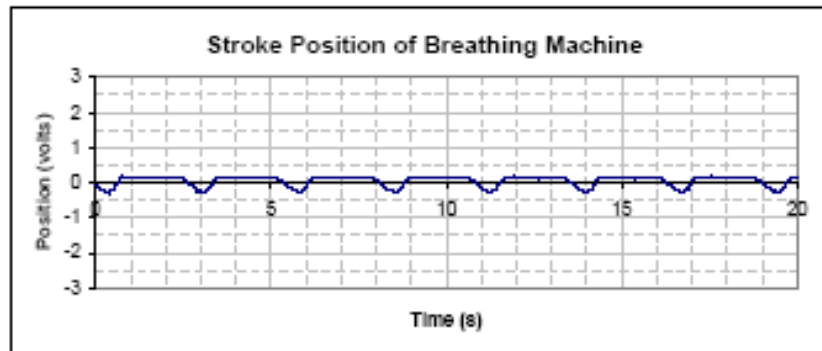
7.5

Inlet Pressure (psig)

40

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 58

Breathing Rate (bpm)

22

Stroke Volume (l)

1.82

Minute Volume (l)

40

Peak Inspired Flow (lpm)

250

Altitude

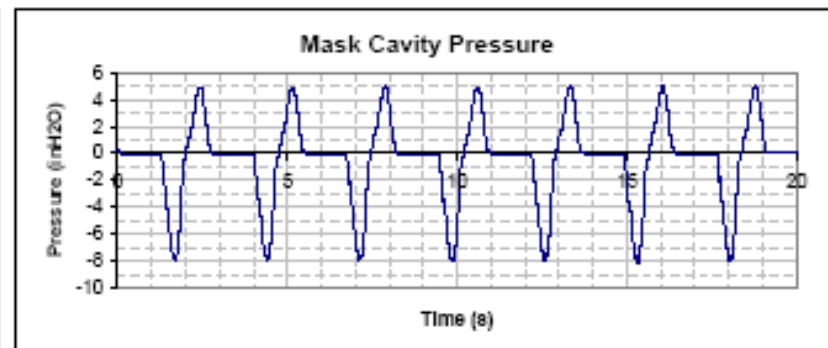
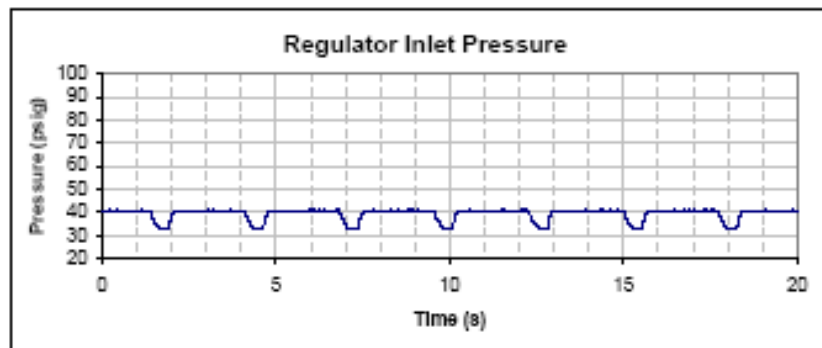
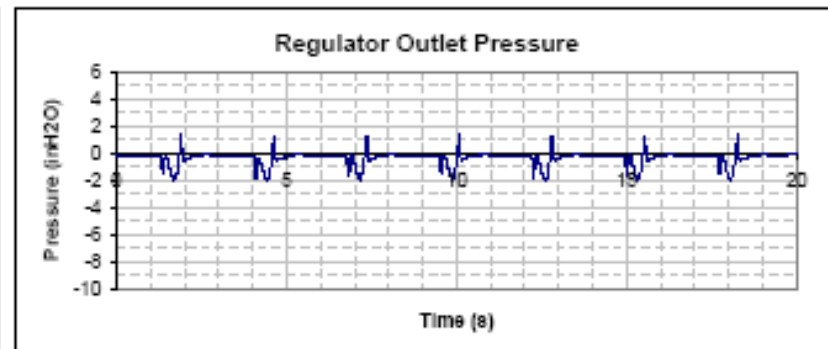
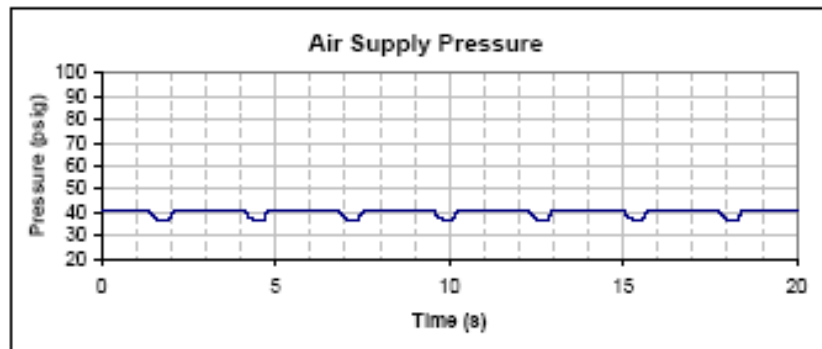
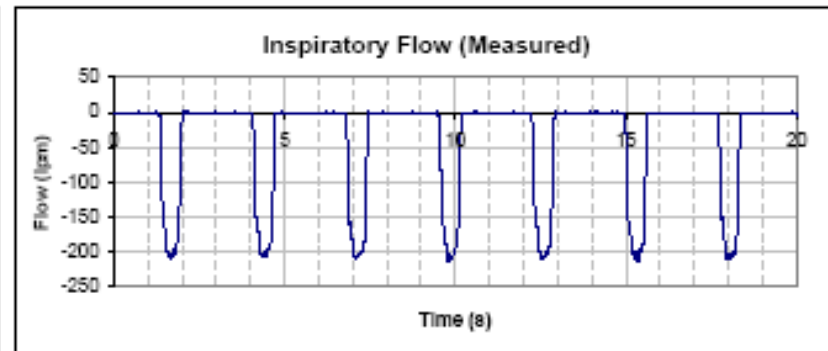
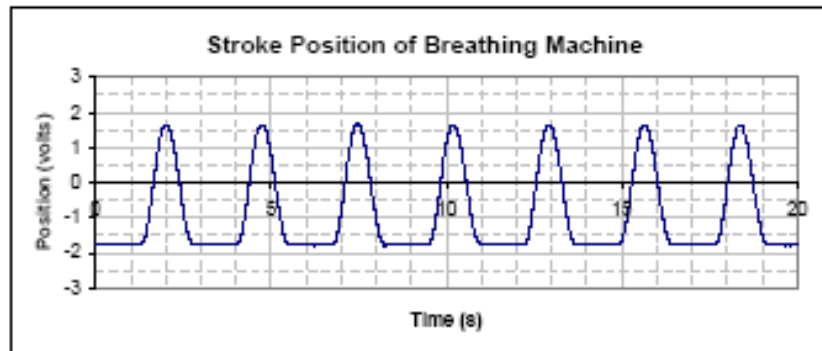
7.5

Inlet Pressure (psig)

40

Regulator Mode

Dilution





CF188 Oxygen System Compatability Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 59

Breathing Rate (bpm)

8

Stroke Volume (l)

0.625

Minute Volume (l)

5

Peak Inspired Flow (lpm)

20

Altitude

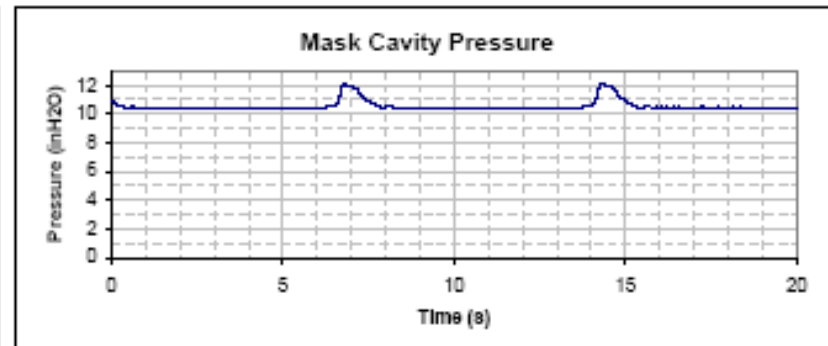
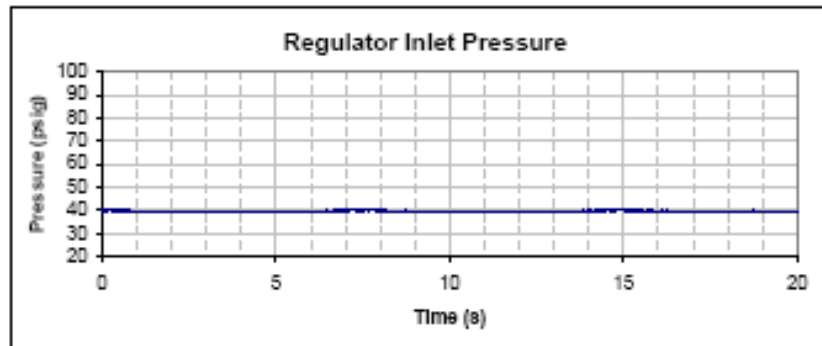
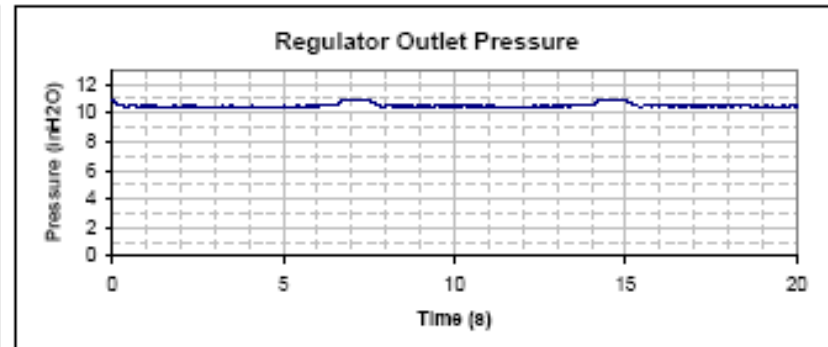
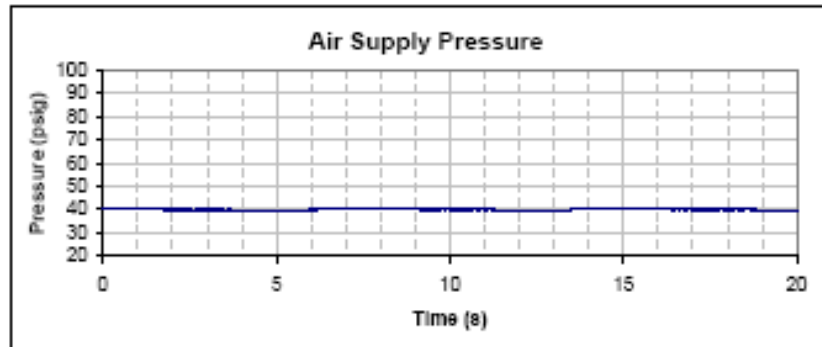
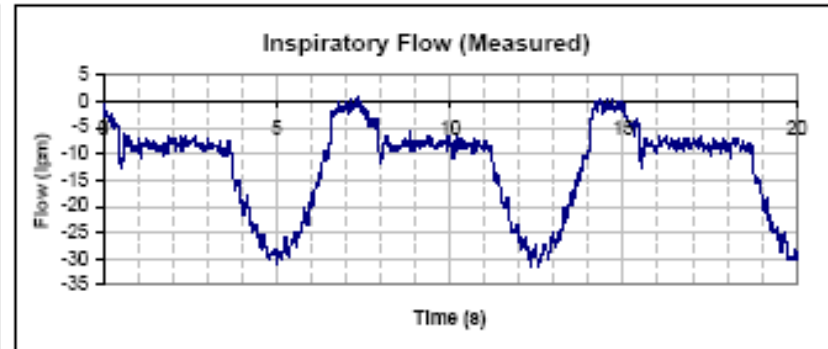
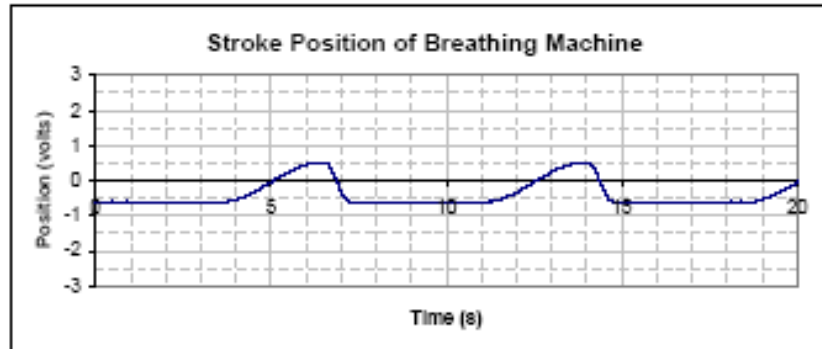
45

Inlet Pressure (psig)

40

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 60

Breathing Rate (bpm)

8

Stroke Volume (l)

2.5

Minute Volume (l)

20

Peak Inspired Flow (lpm)

80

Altitude

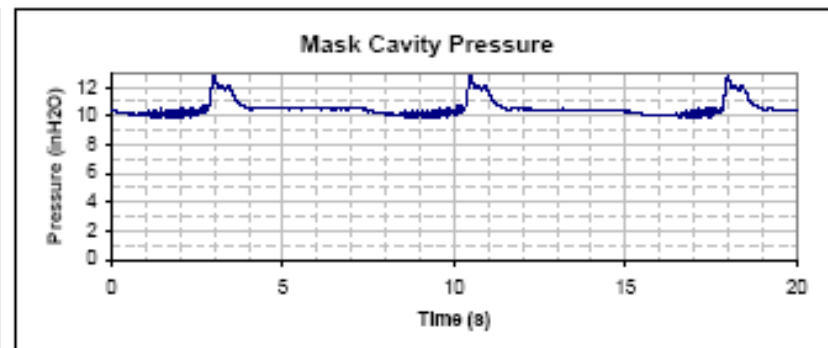
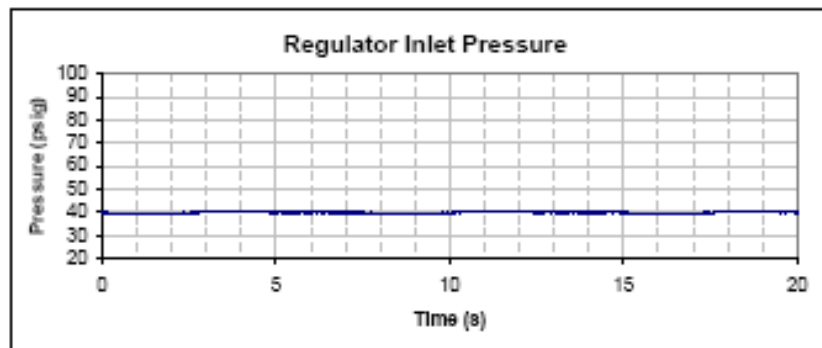
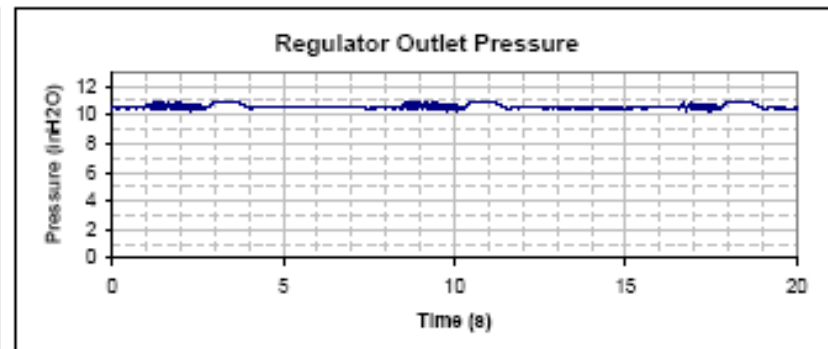
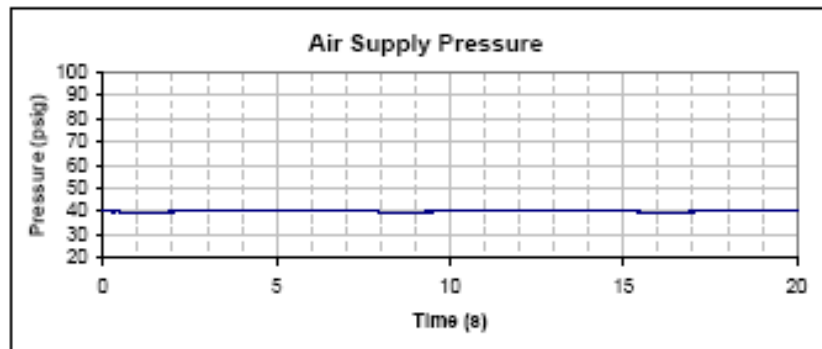
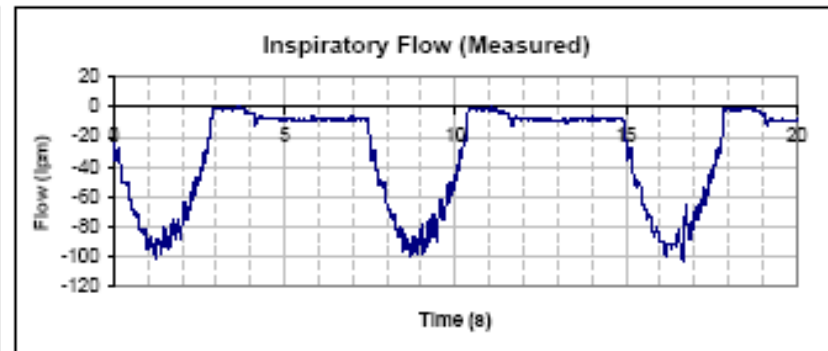
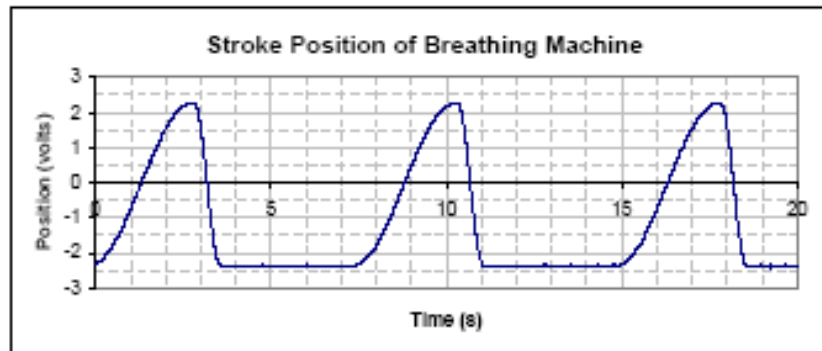
45

Inlet Pressure (psig)

40

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 61

Breathing Rate (bpm)

22

Stroke Volume (l)

0.23

Minute Volume (l)

5

Peak Inspired Flow (lpm)

20

Altitude

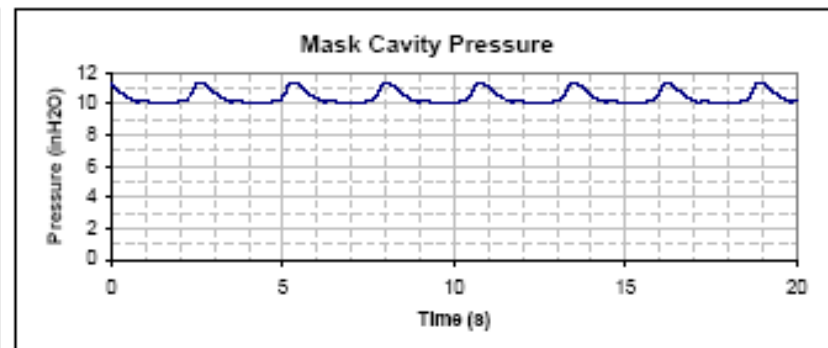
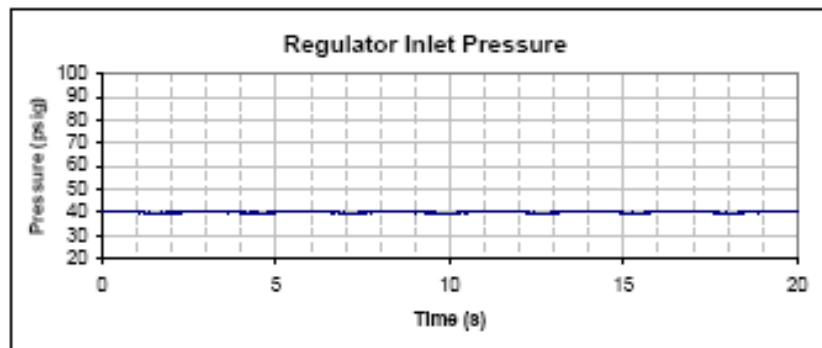
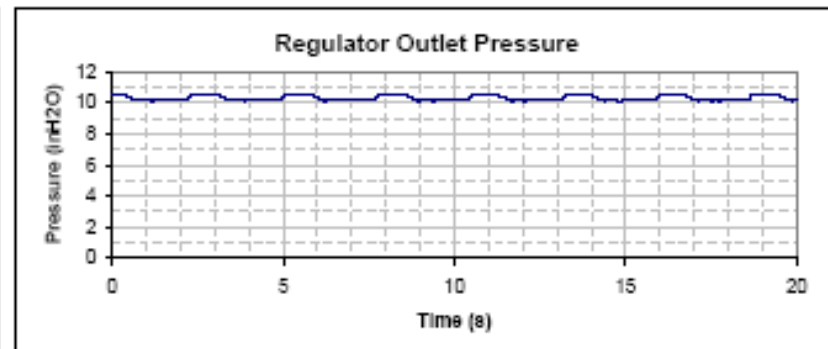
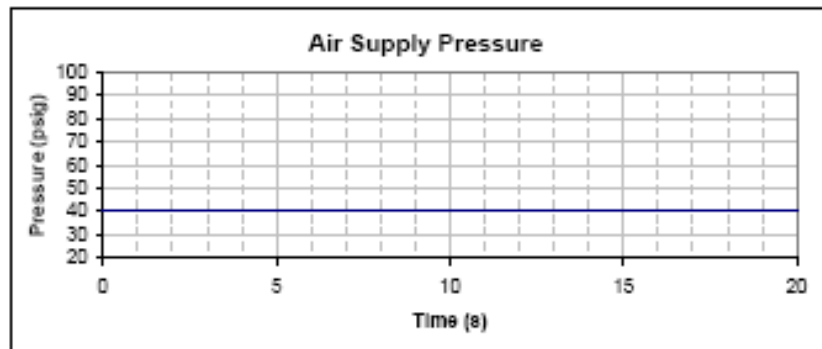
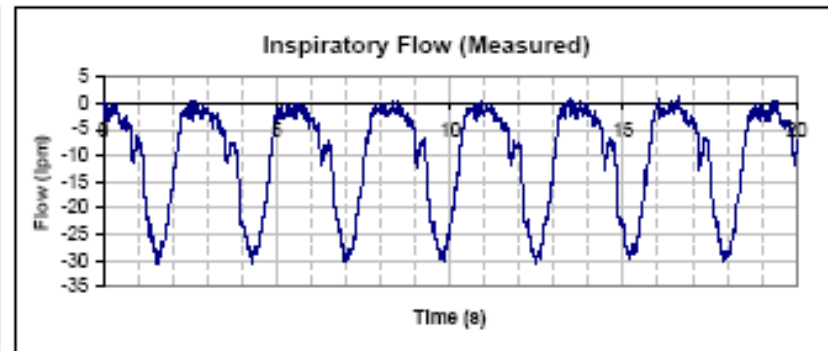
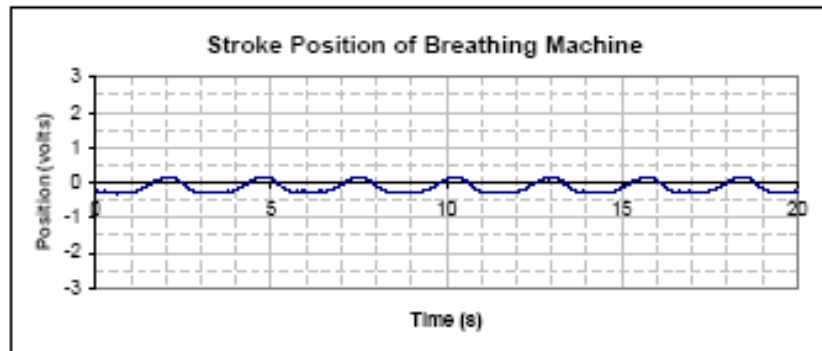
45

Inlet Pressure (psig)

40

Regulator Mode

Dilution



CF188 Oxygen System Compatibility Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 62

Breathing Rate (bpm)

22

Stroke Volume (l)

1.82

Minute Volume (l)

40

Peak Inspired Flow (lpm)

160

Altitude

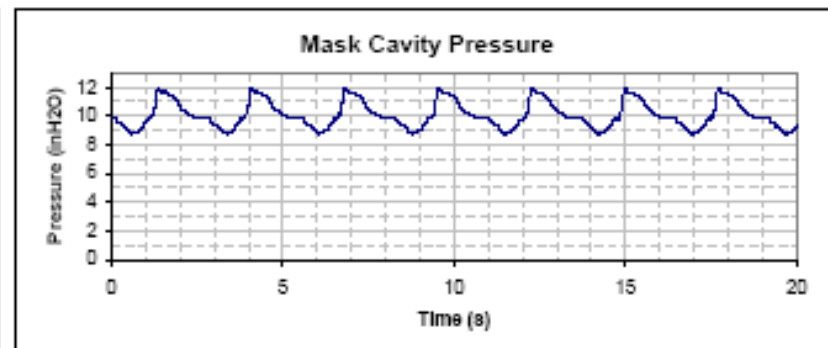
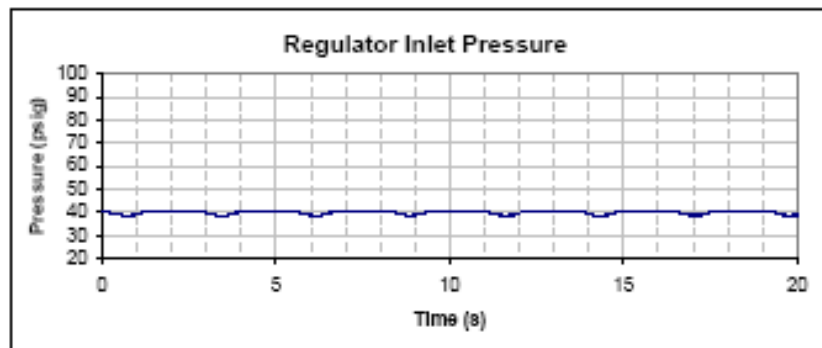
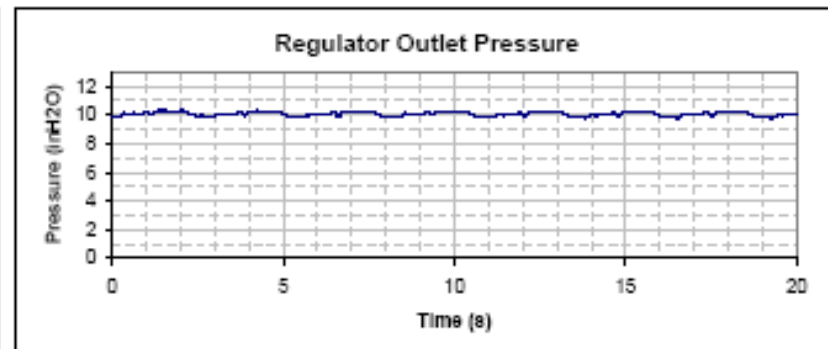
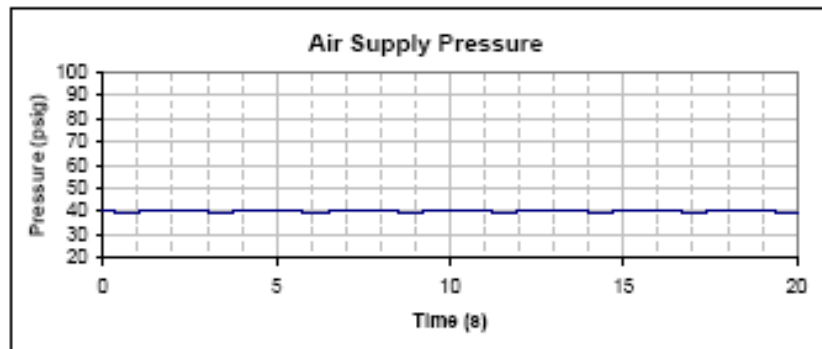
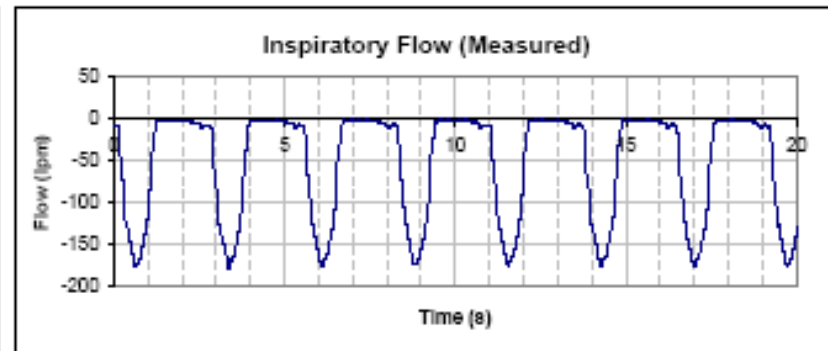
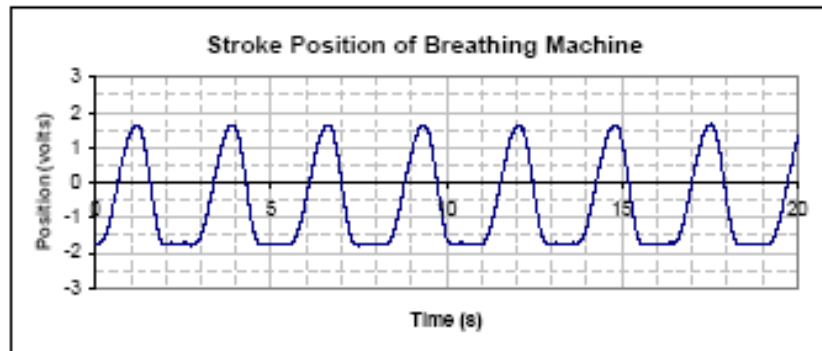
45

Inlet Pressure (psig)

40

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 63

Breathing Rate (bpm)

8

Stroke Volume (l)

0.625

Minute Volume (l)

5

Peak Inspired Flow (lpm)

50

Altitude

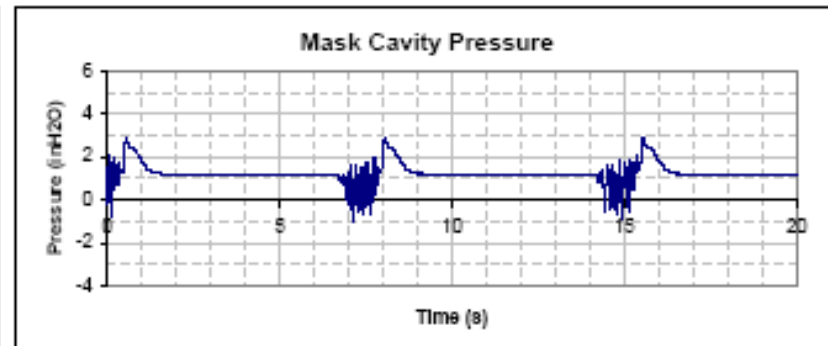
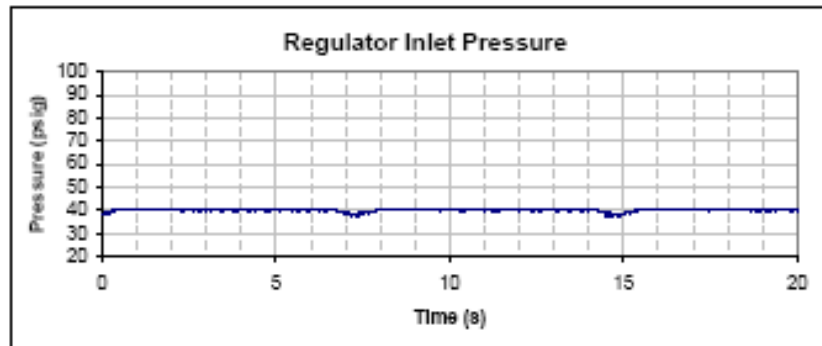
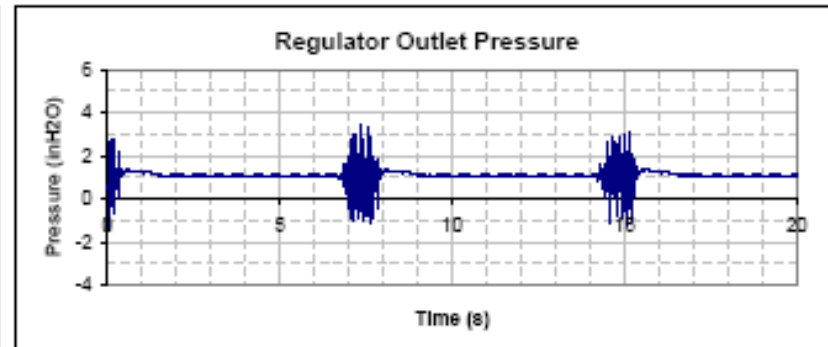
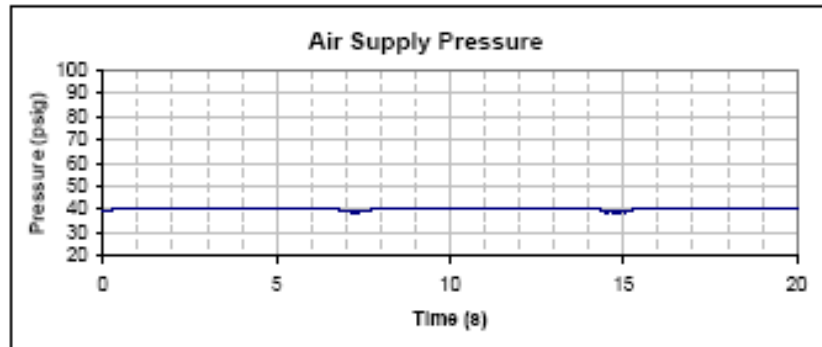
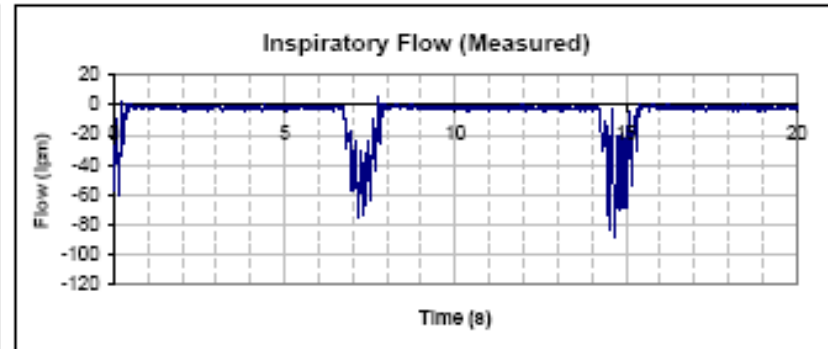
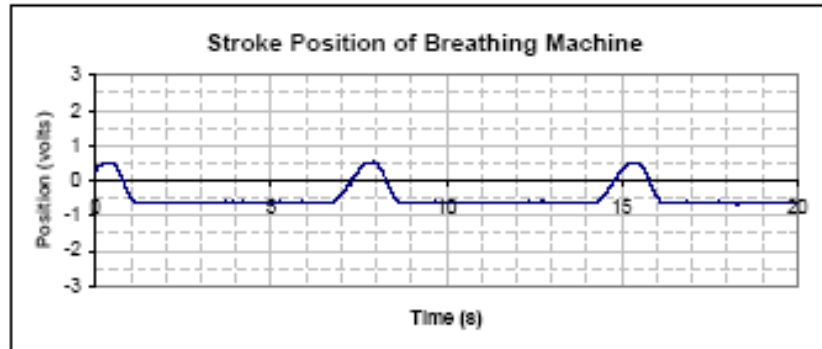
7.5

Inlet Pressure (psig)

40

Regulator Mode

100%



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 64

Breathing Rate (bpm)

8

Stroke Volume (l)

2.5

Minute Volume (l)

20

Peak Inspired Flow (lpm)

200

Altitude

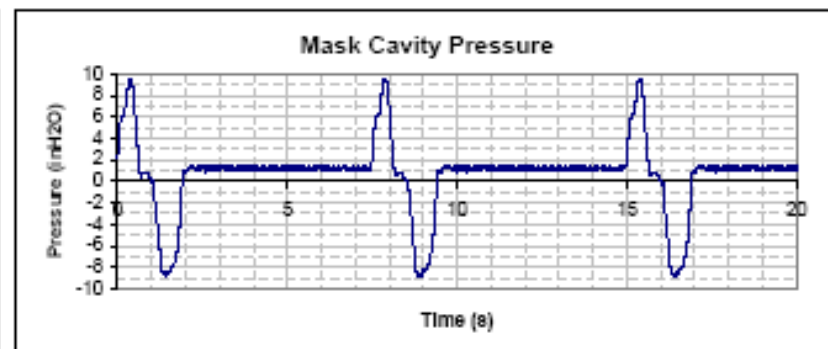
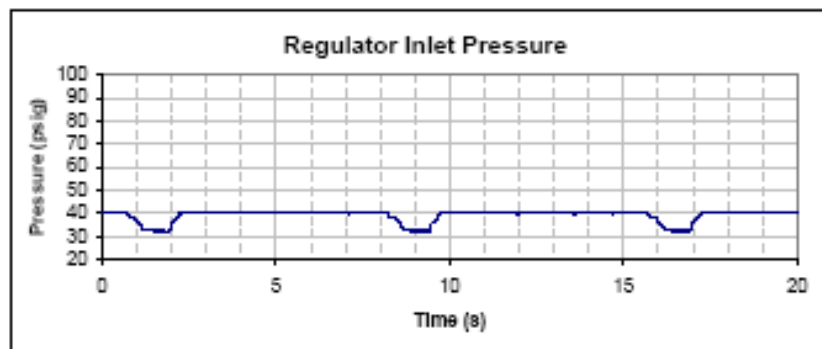
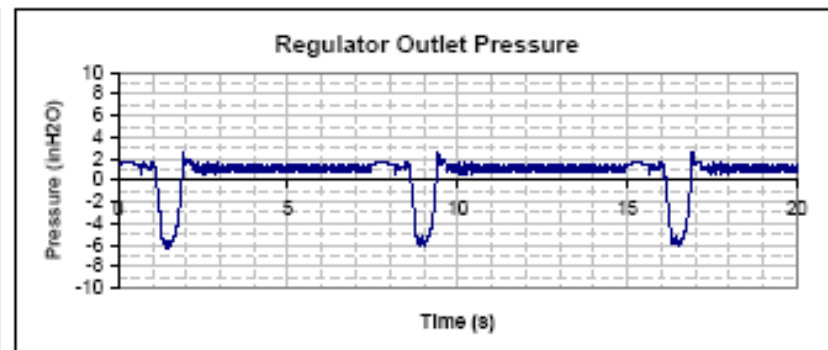
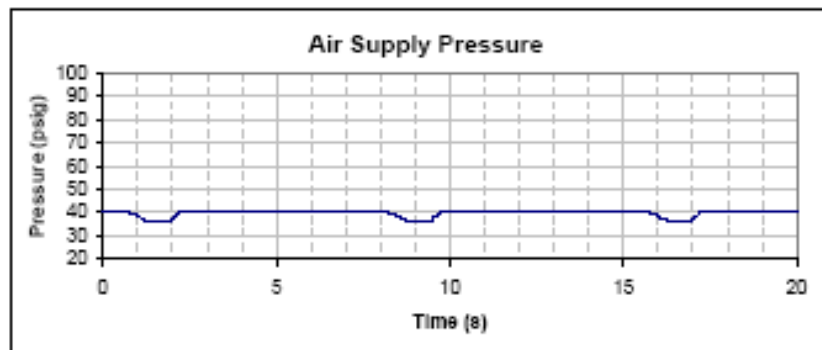
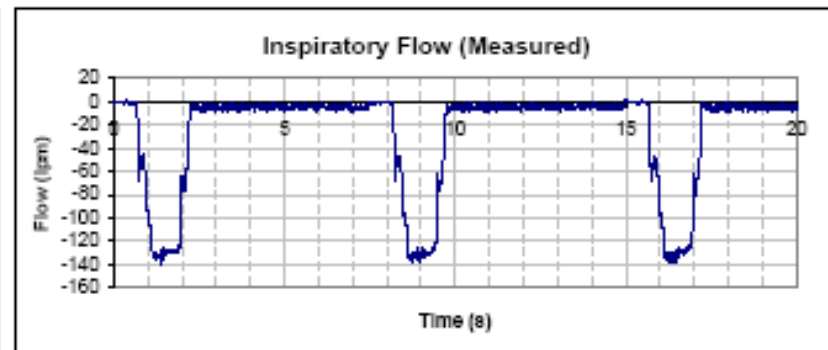
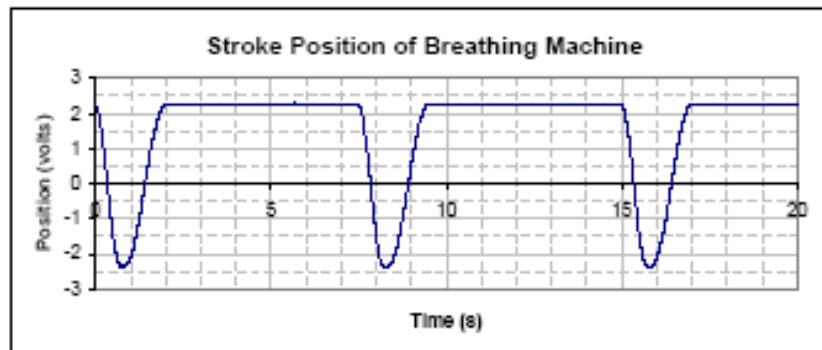
7.5

Inlet Pressure (psig)

40

Regulator Mode

100%



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 65

Breathing Rate (bpm)

22

Stroke Volume (l)

0.23

Minute Volume (l)

5

Peak Inspired Flow (lpm)

50

Altitude

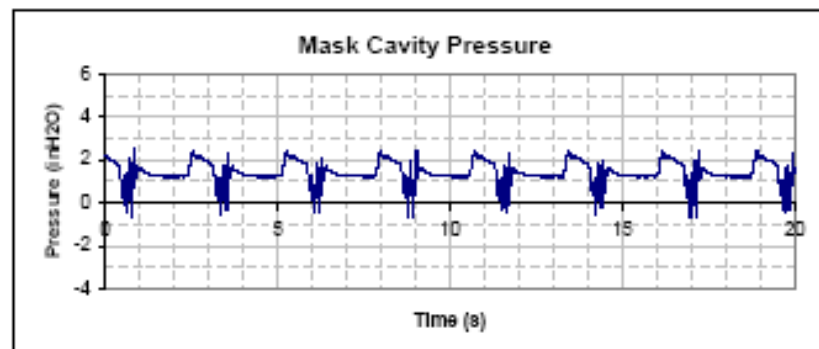
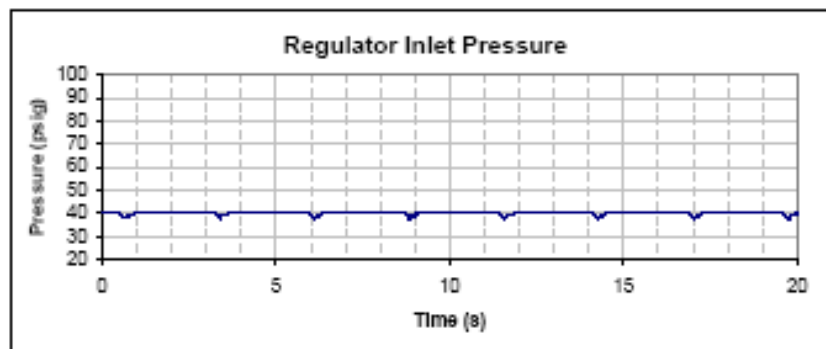
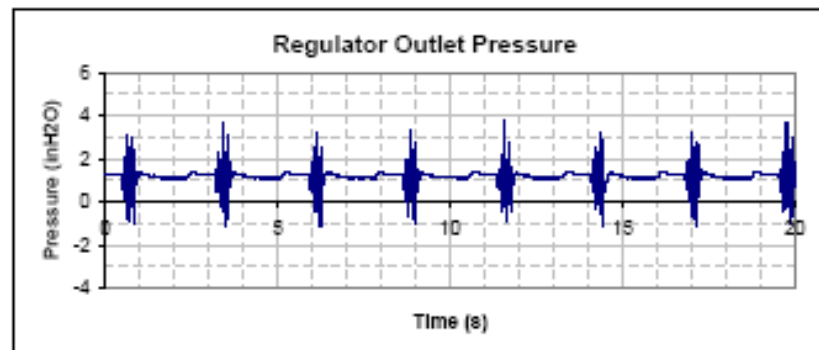
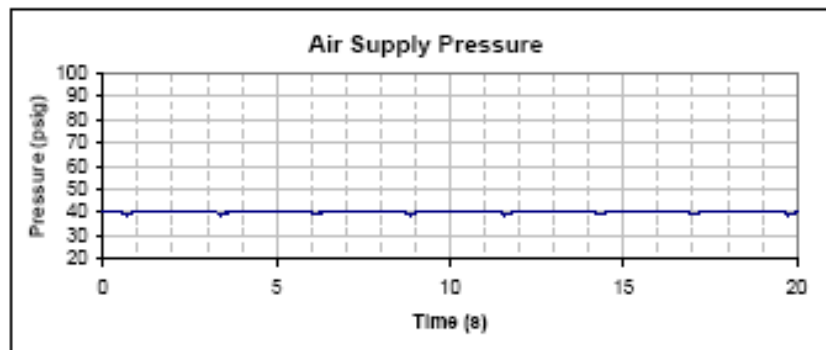
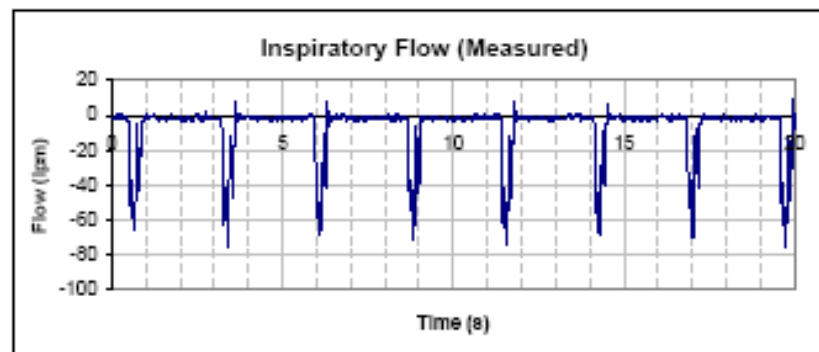
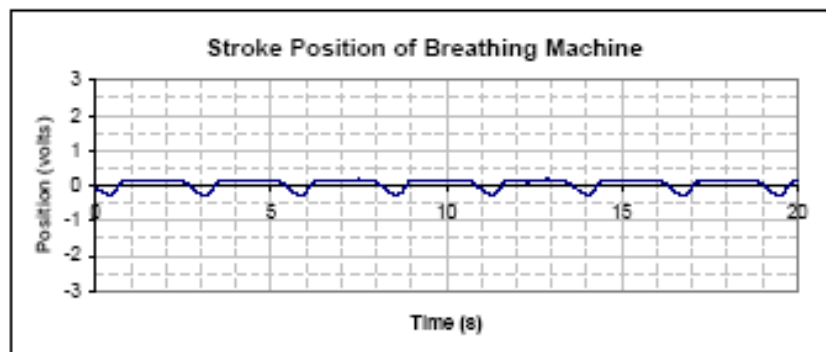
7.5

Inlet Pressure (psig)

40

Regulator Mode

100%



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 66

Breathing Rate (bpm)

22

Stroke Volume (l)

1.82

Minute Volume (l)

40

Peak Inspired Flow (lpm)

250

Altitude

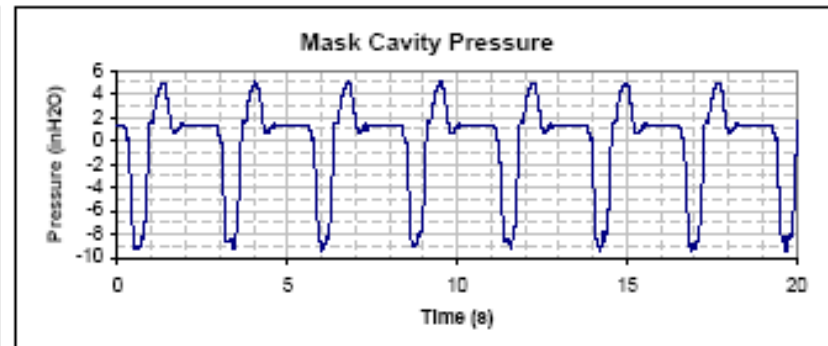
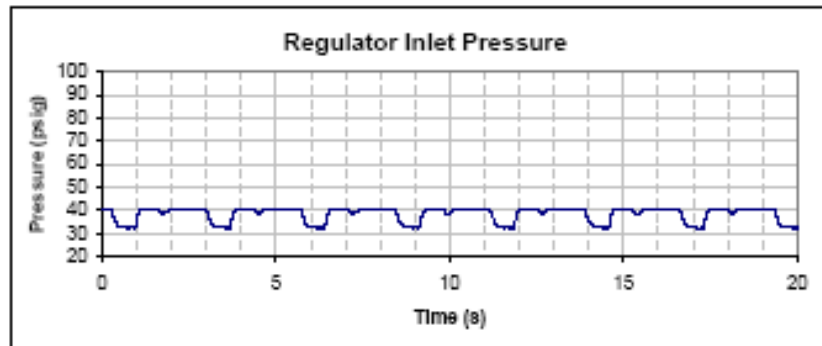
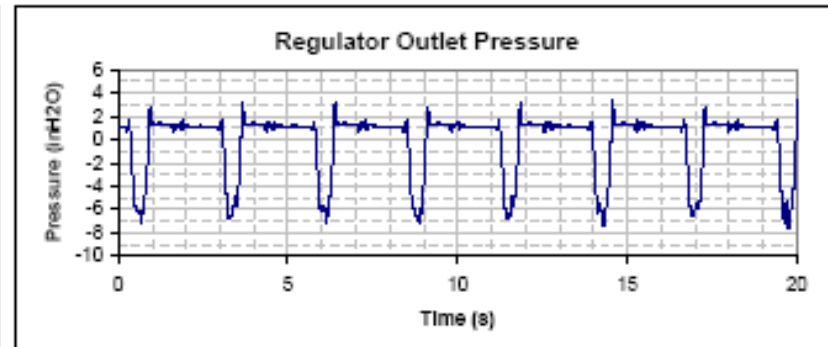
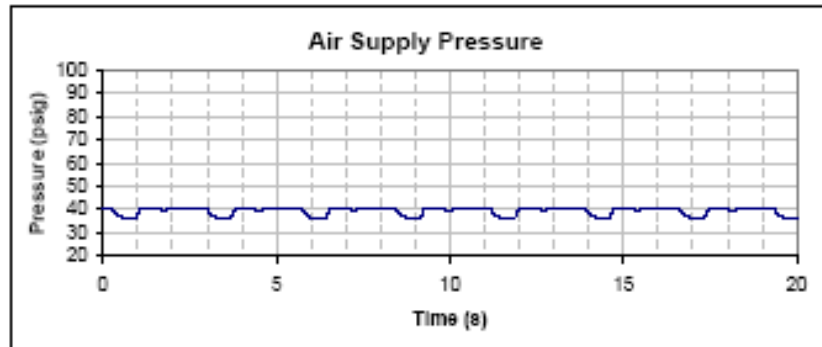
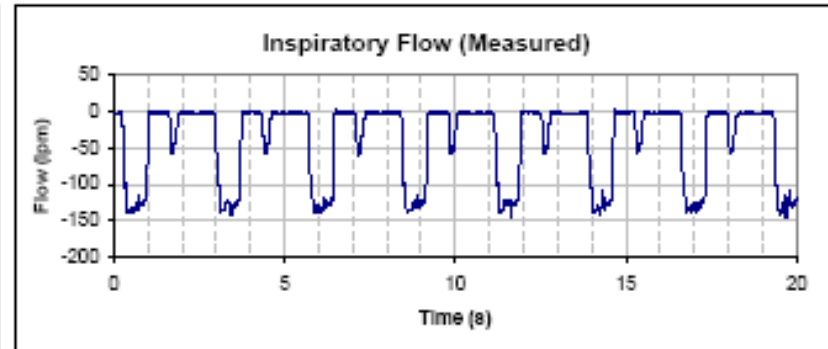
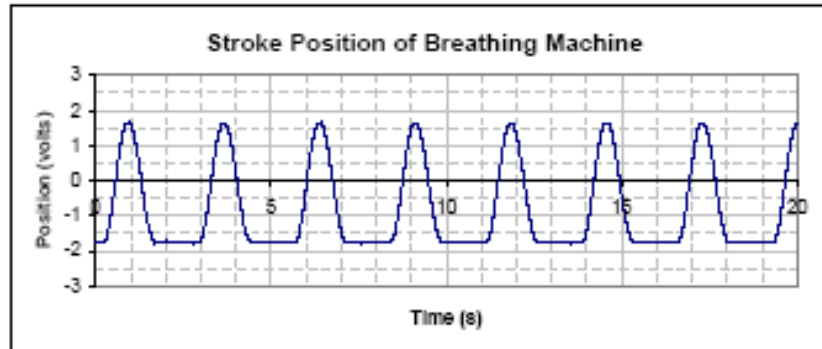
7.5

Inlet Pressure (psig)

40

Regulator Mode

100%





CF188 Oxygen System Compatability Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 67

Breathing Rate (bpm)

8

Stroke Volume (l)

0.625

Minute Volume (l)

5

Peak Inspired Flow (lpm)

20

Altitude

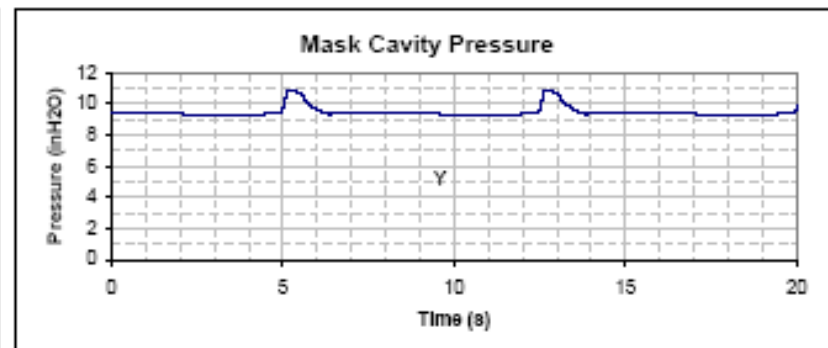
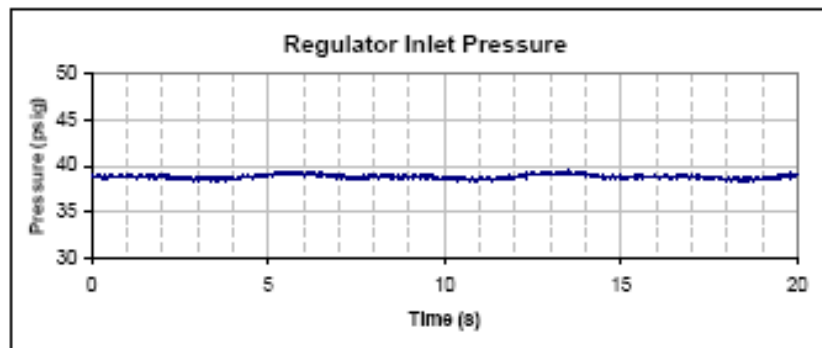
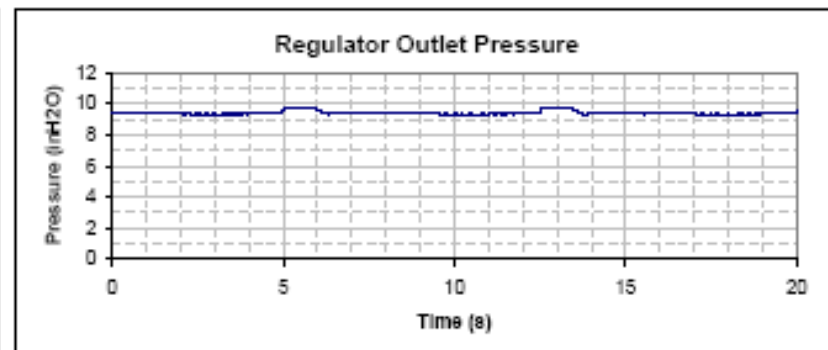
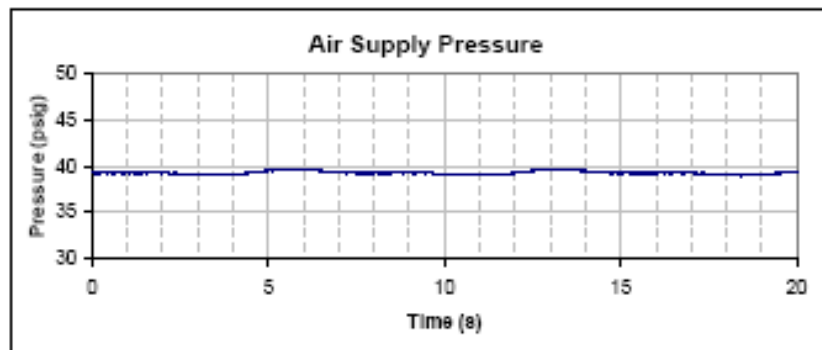
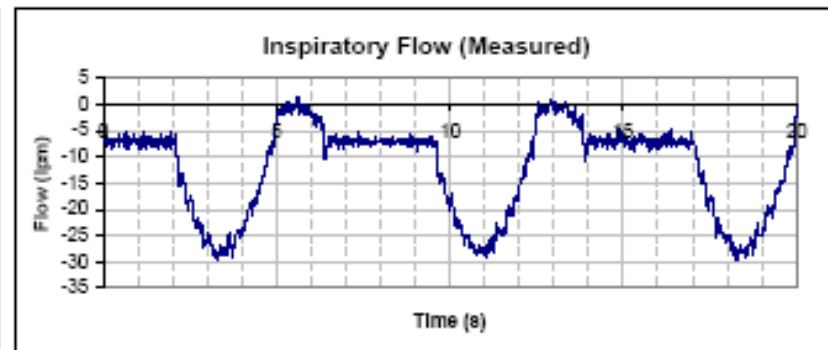
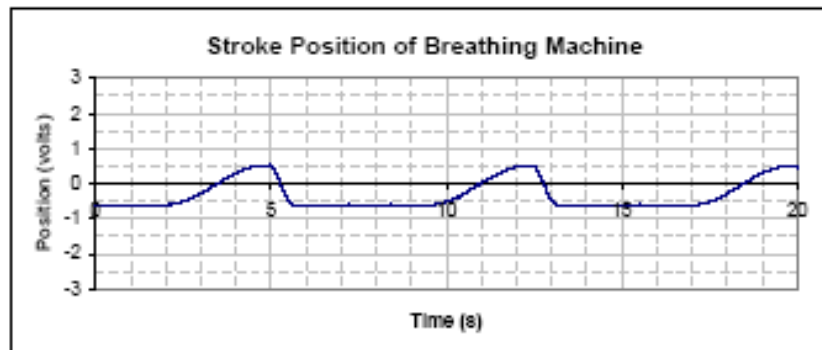
45

Inlet Pressure (psig)

40

Regulator Mode

100%



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 68

Breathing Rate (bpm)

8

Stroke Volume (l)

2.5

Minute Volume (l)

20

Peak Inspired Flow (lpm)

80

Altitude

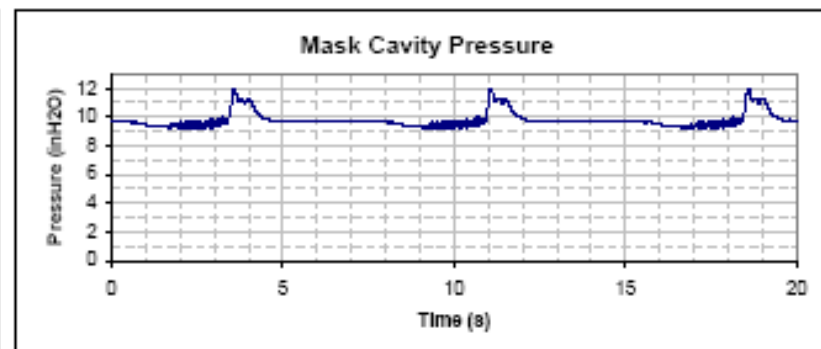
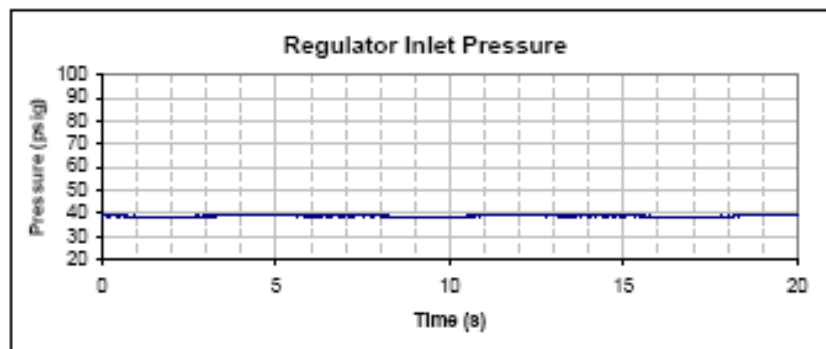
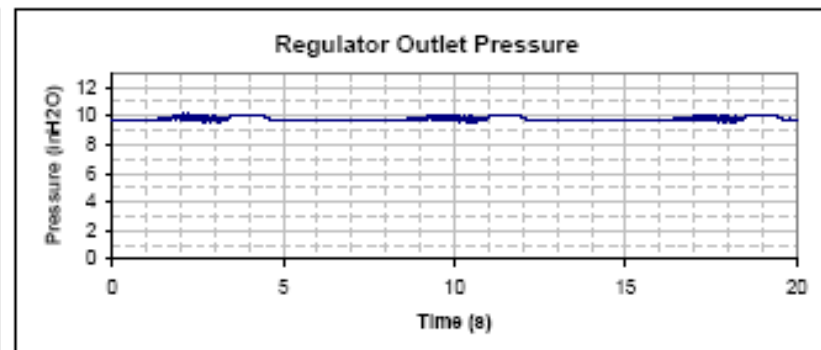
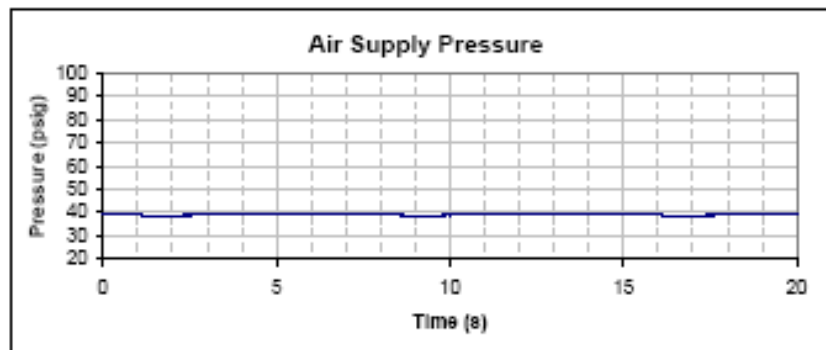
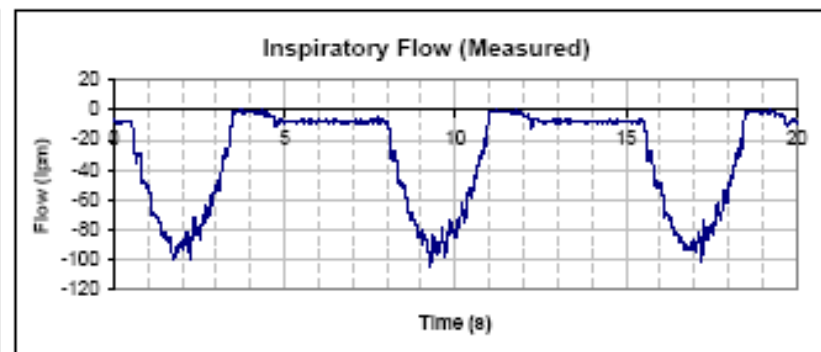
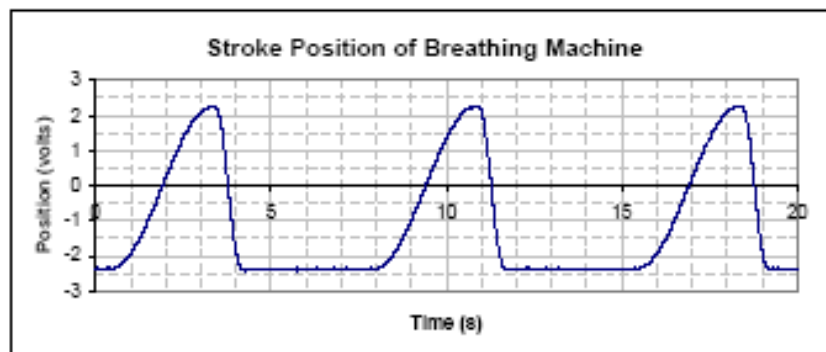
45

Inlet Pressure (psig)

40

Regulator Mode

100%



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 69

Breathing Rate (bpm)

22

Stroke Volume (l)

0.23

Minute Volume (l)

5

Peak Inspired Flow (lpm)

20

Altitude

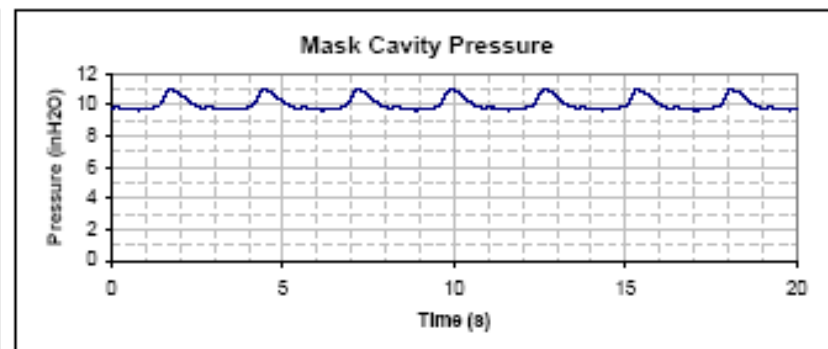
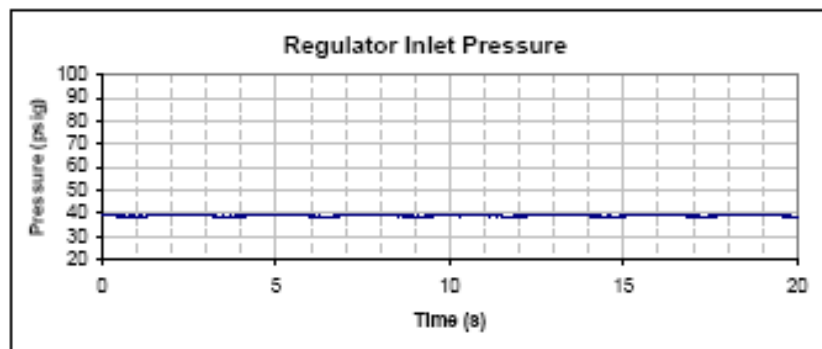
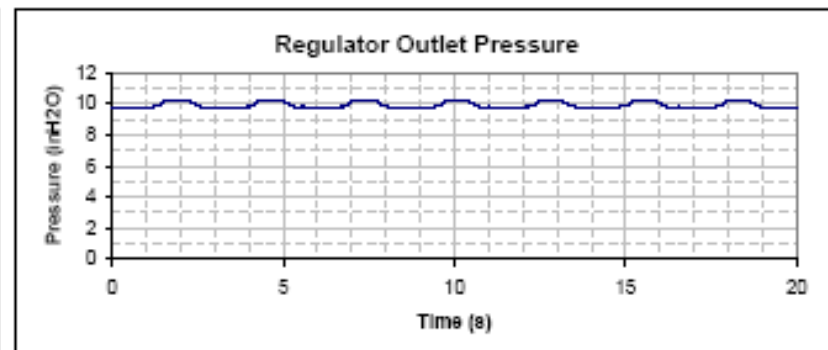
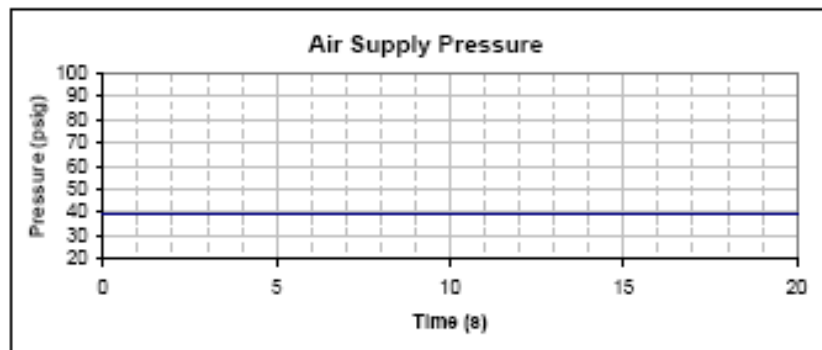
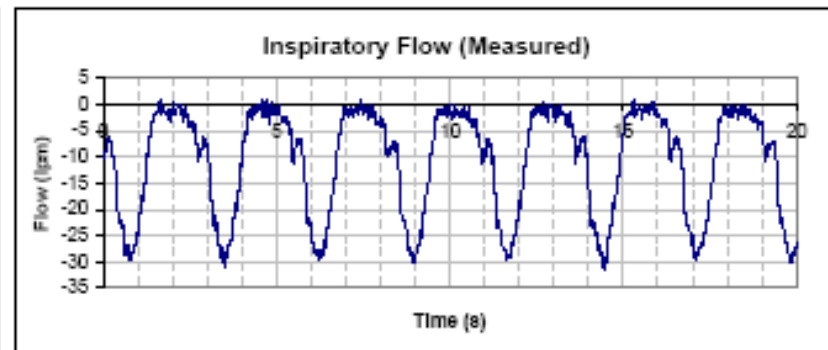
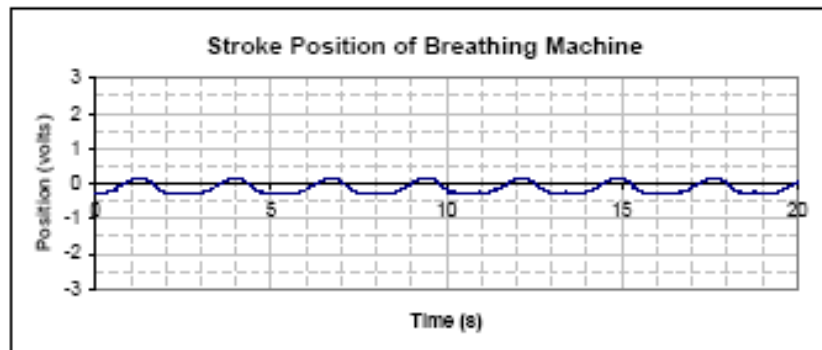
45

Inlet Pressure (psig)

40

Regulator Mode

100%



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 5 - Multi Extremes

Settings

Test #: 70

Breathing Rate (bpm)

22

Stroke Volume (l)

1.82

Minute Volume (l)

40

Peak Inspired Flow (lpm)

160

Altitude

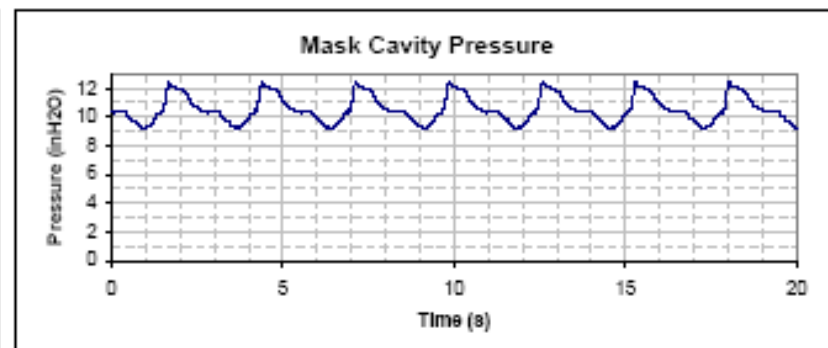
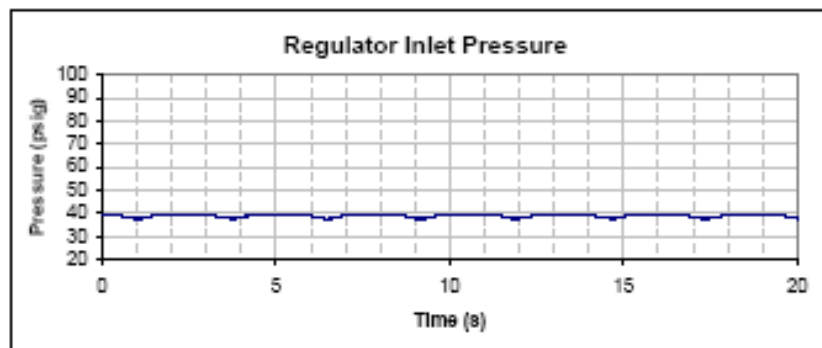
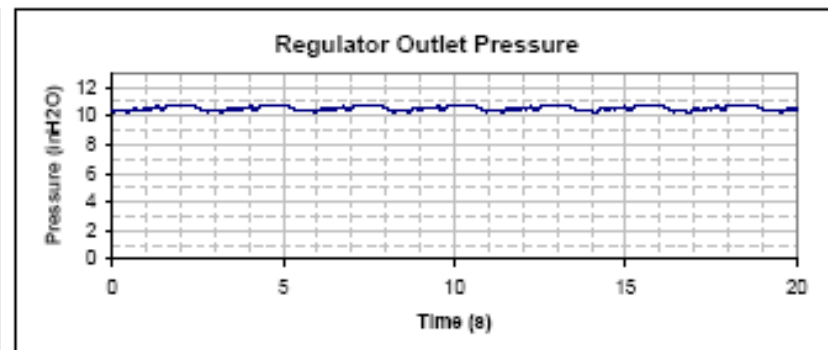
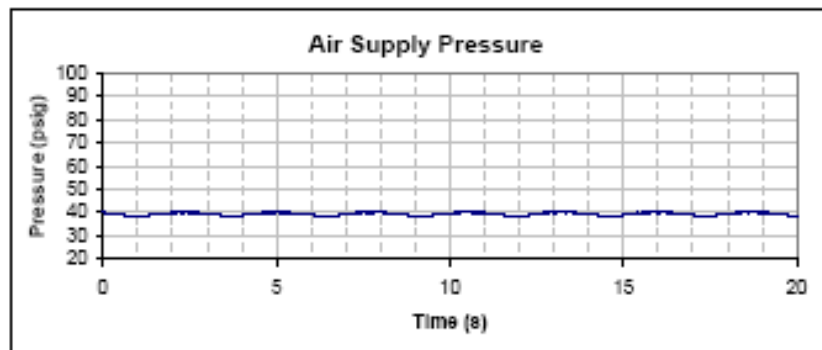
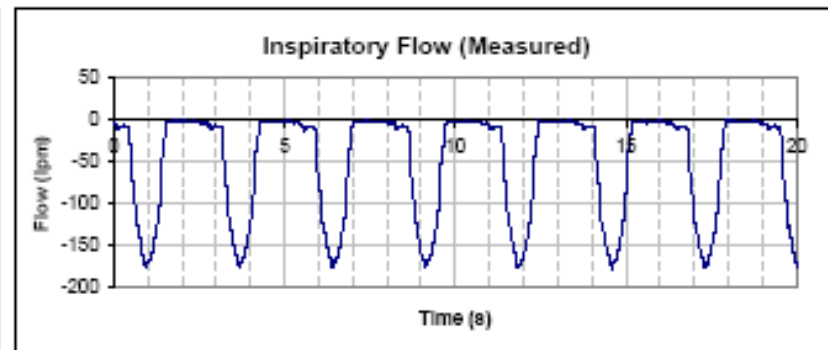
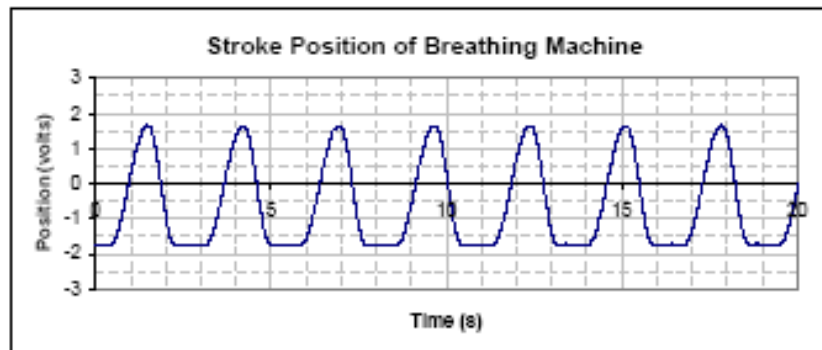
45

Inlet Pressure (psig)

40

Regulator Mode

100%



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 8 - Varied Breathing

Rate & Flows

Settings

Breathing Rate (bpm)

8

Stroke Volume (l)

0.625

Test #: 71

Minute Volume (l)

5

Peak Inspired Flow (lpm)

30

Altitude

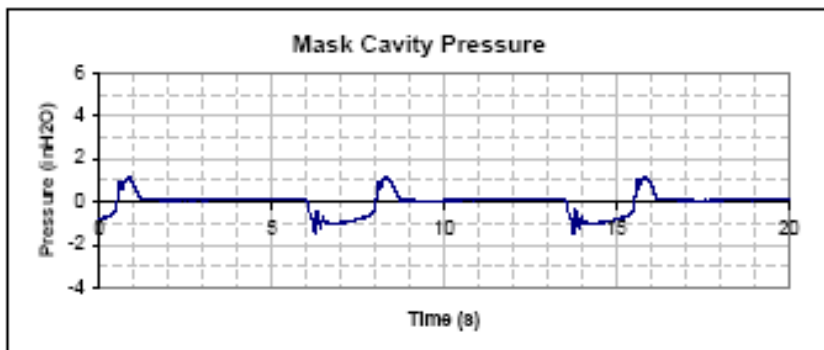
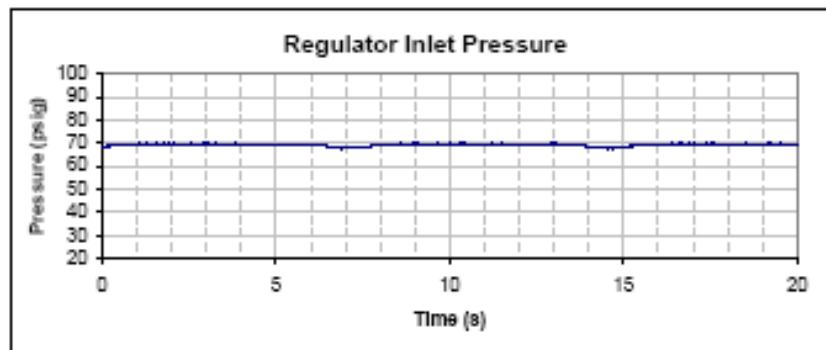
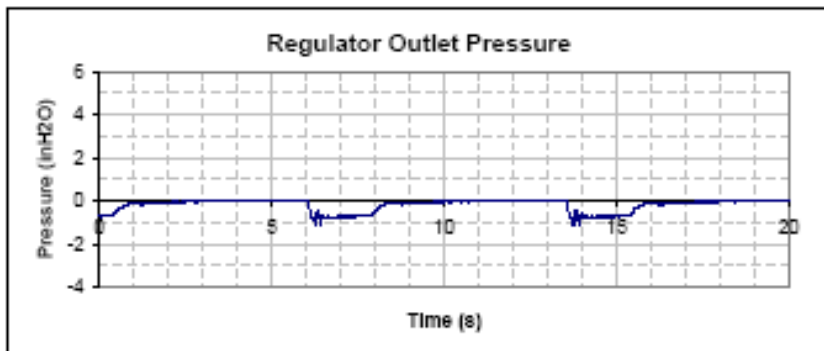
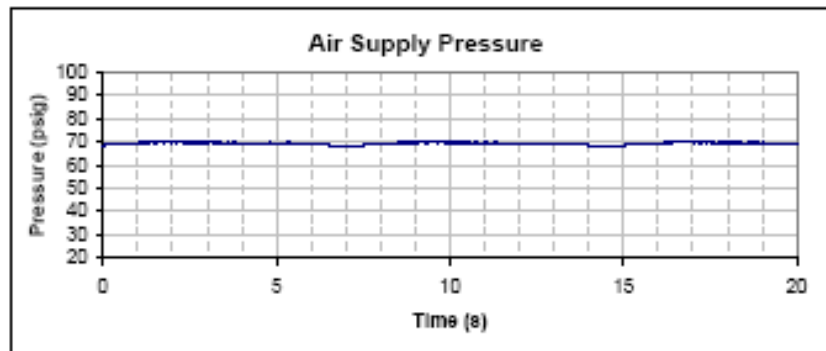
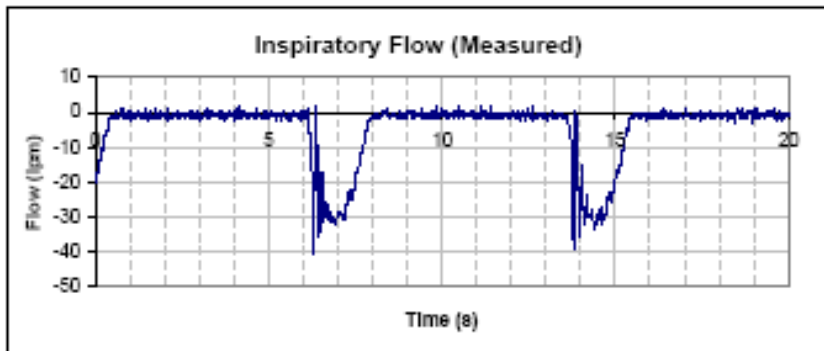
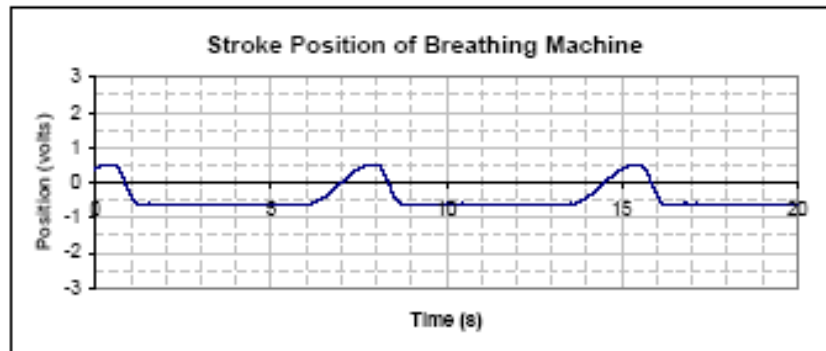
GL

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 8 - Varied Breathing

Rate & Flows

Settings

Breathing Rate (bpm)

8

Stroke Volume (l)

1.25

Test #: 72

Minute Volume (l)

10

Peak Inspired Flow (lpm)

60

Altitude

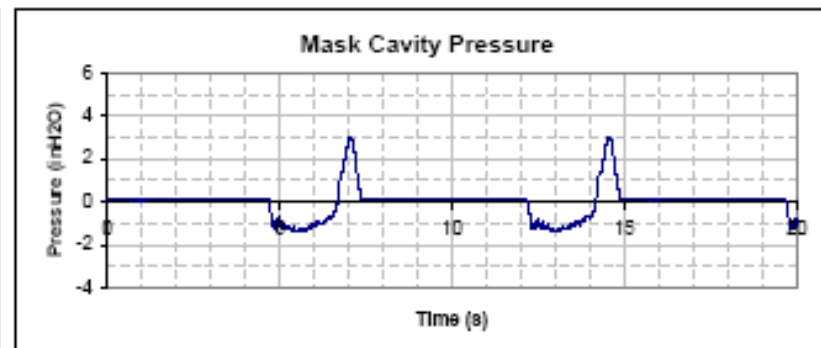
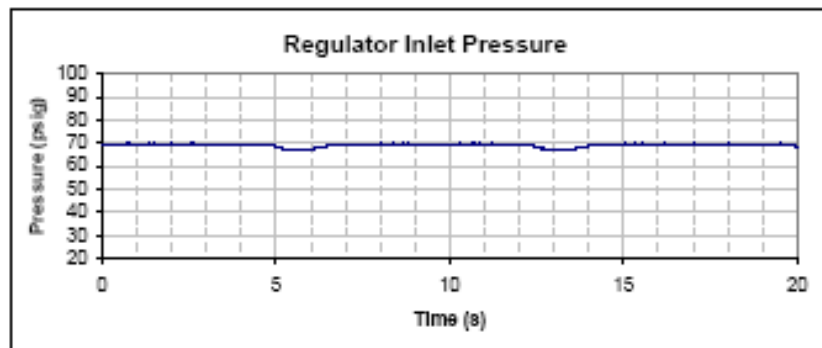
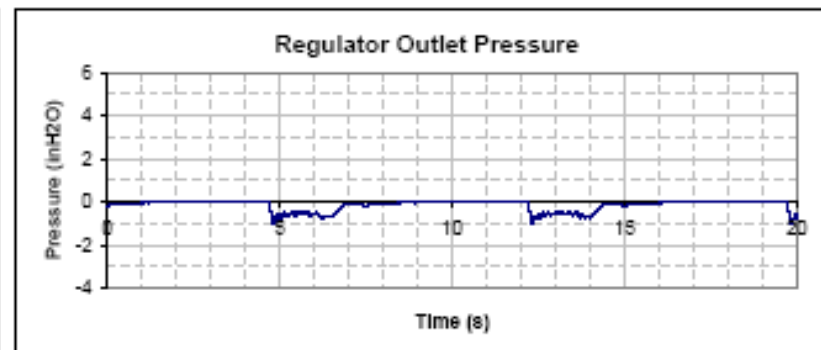
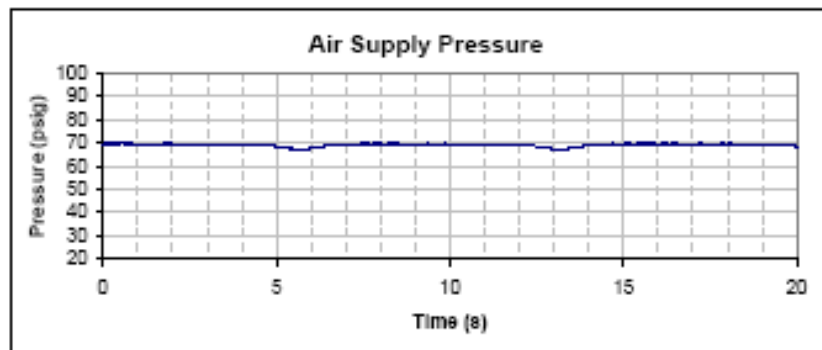
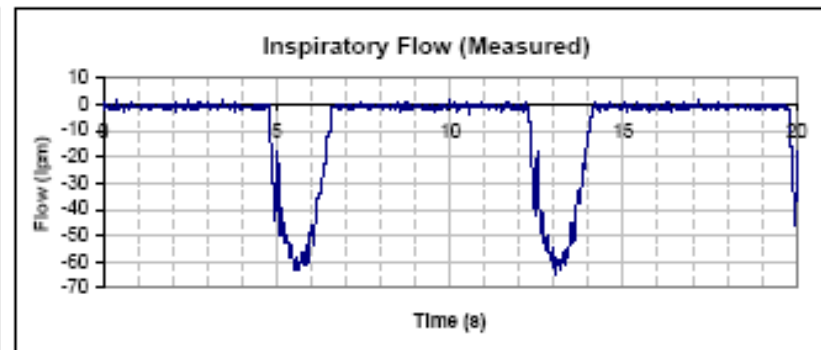
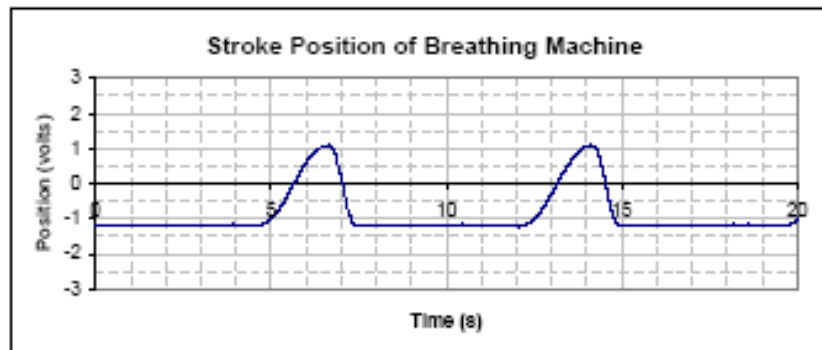
GL

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 8 - Varied Breathing

Rate & Flows

Settings

Breathing Rate (bpm)

15

Stroke Volume (l)

0.33

Test #: 73

Minute Volume (l)

5

Peak Inspired Flow (lpm)

30

Altitude

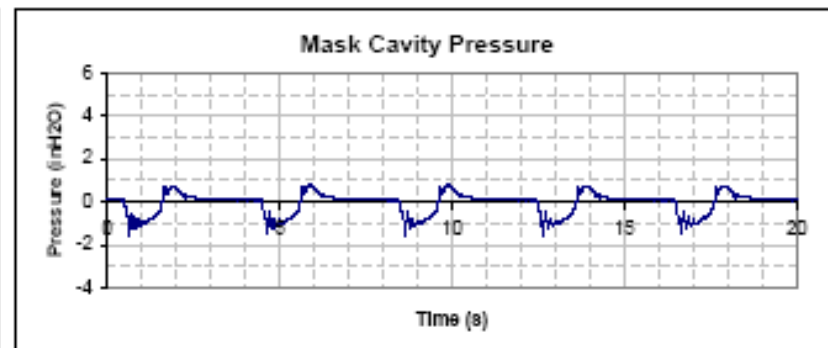
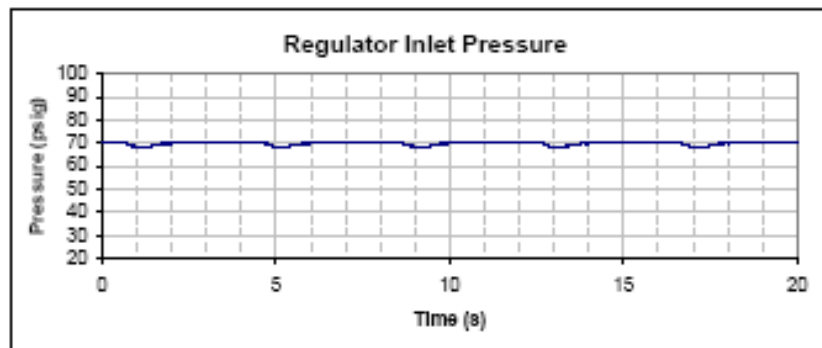
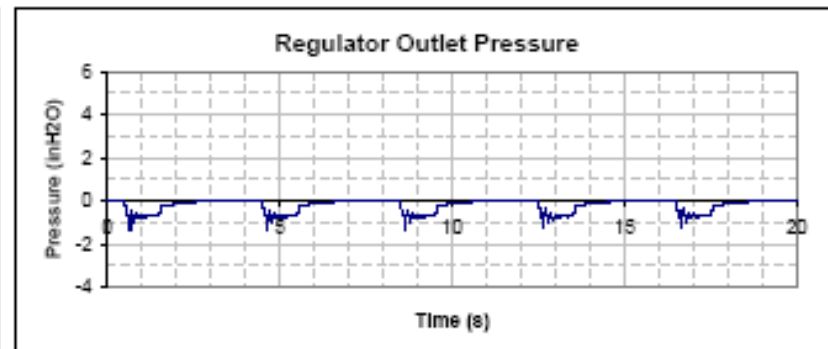
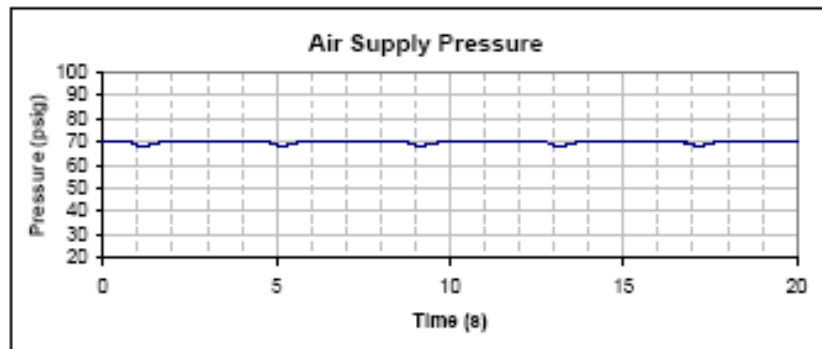
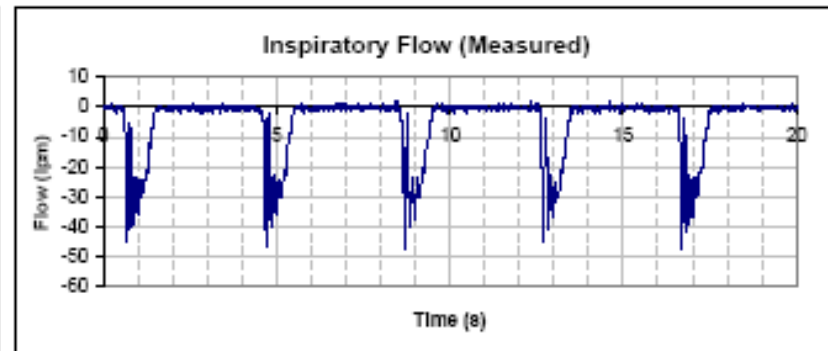
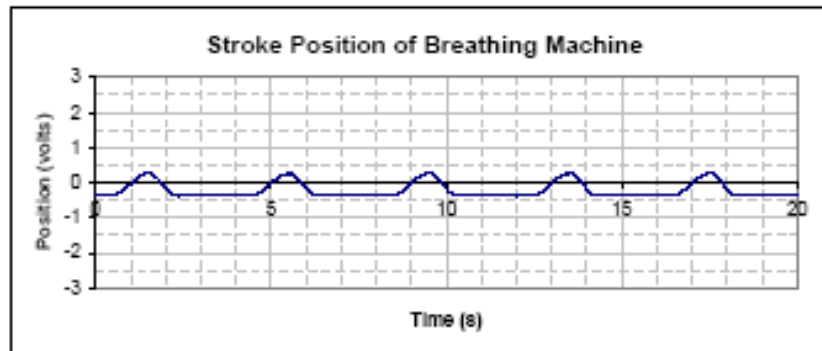
GL

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 6 - Varied Breathing

Rate & Flows

Settings

Breathing Rate (bpm)

15

Stroke Volume (l)

0.67

Test #: 74

Minute Volume (l)

10

Peak Inspired Flow (lpm)

60

Altitude

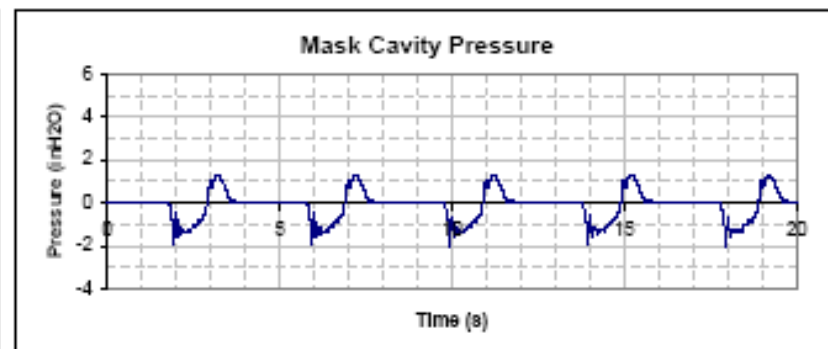
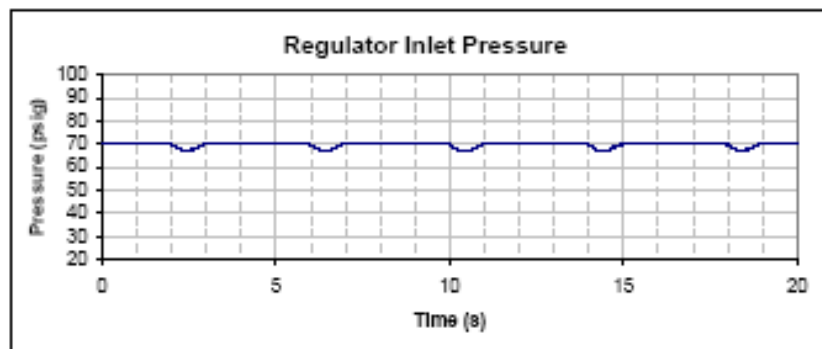
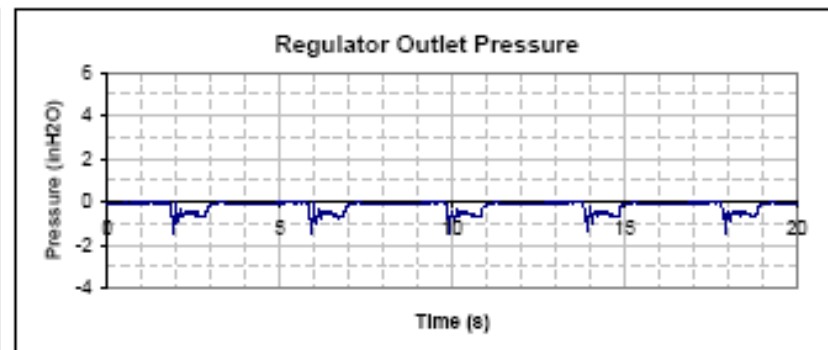
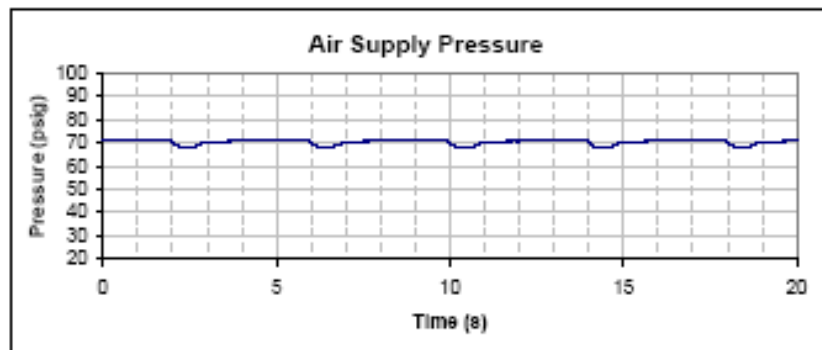
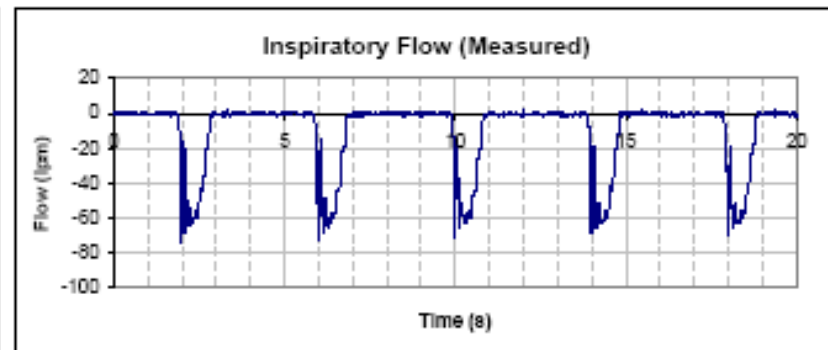
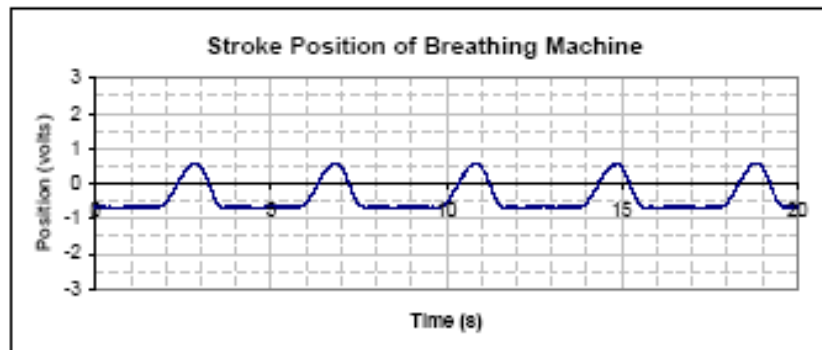
GL

Inlet Pressure (psig)

70

Regulator Mode

Dilution





CF188 Oxygen System Compatability Test - NACES Configuration

Group: 8 - Varied Breathing

Rate & Flows

Settings

Breathing Rate (bpm)

15

Stroke Volume (l)

2

Test #: 75

Minute Volume (l)

30

Peak Inspired Flow (lpm)

180

Altitude

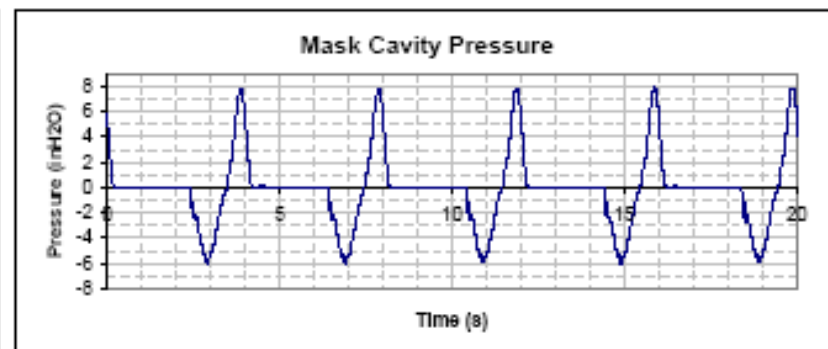
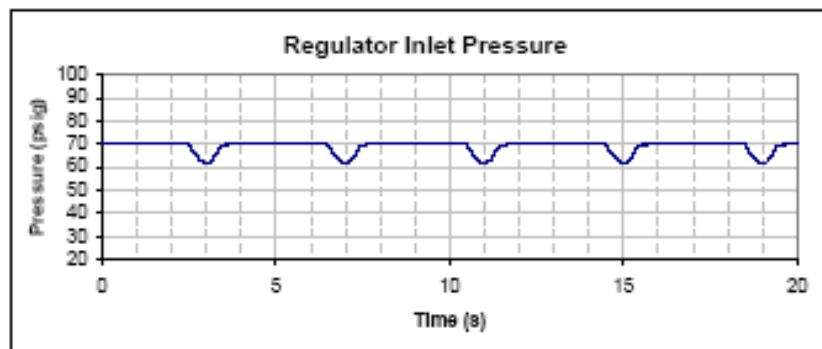
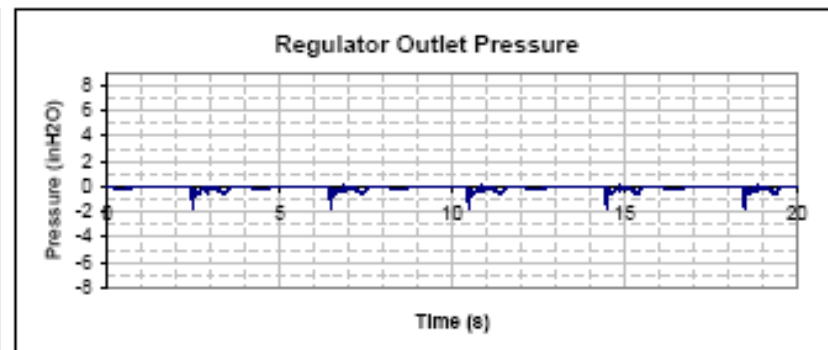
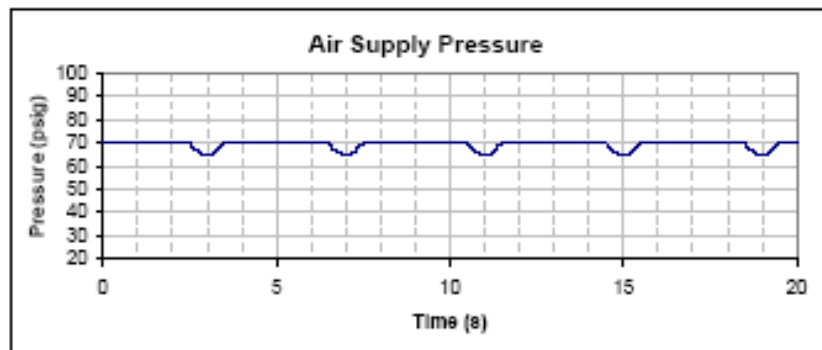
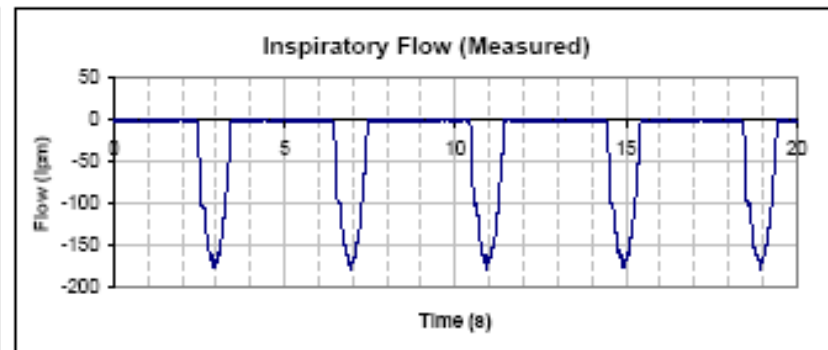
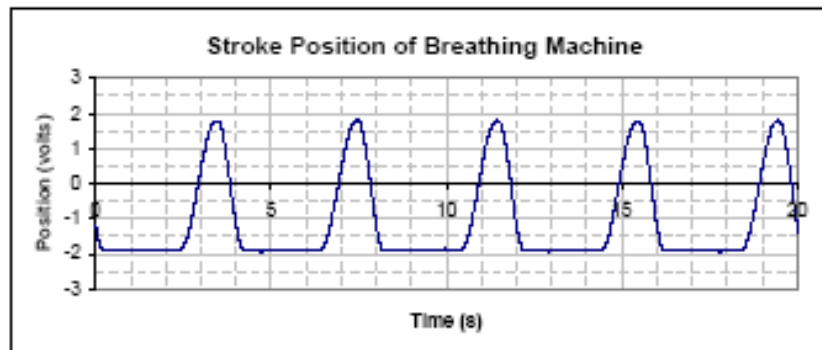
GL

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 8 - Varied Breathing

Rate & Flows

Settings

Breathing Rate (bpm)

15

Stroke Volume (l)

2.5

Test #: 76

Minute Volume (l)

37.5

Peak Inspired Flow (lpm)

250

Altitude

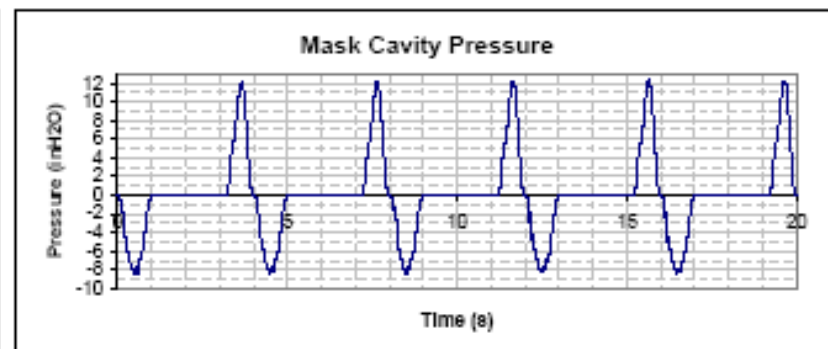
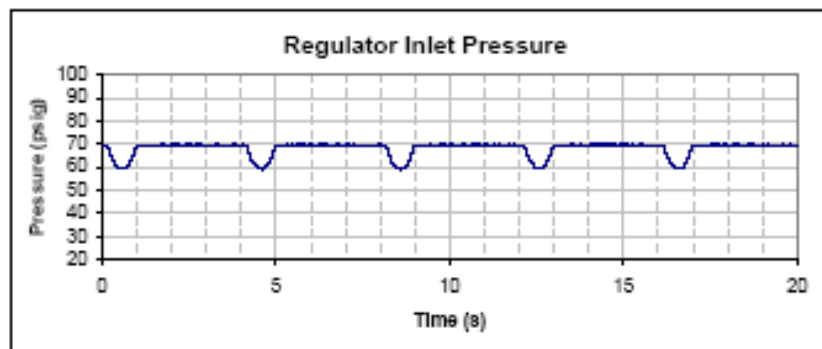
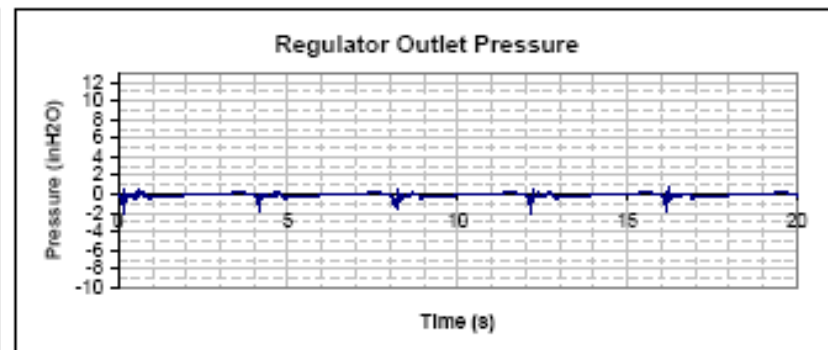
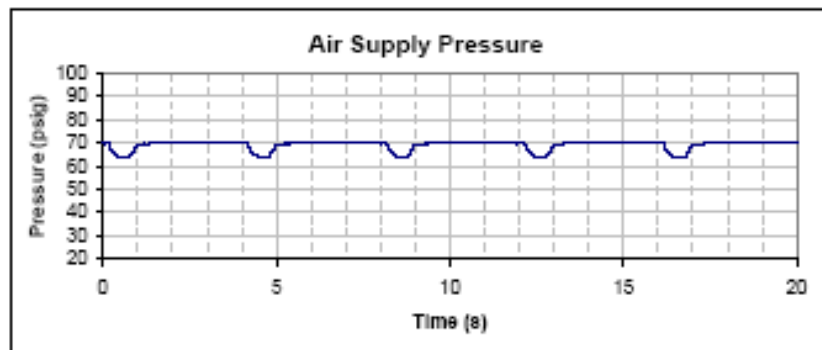
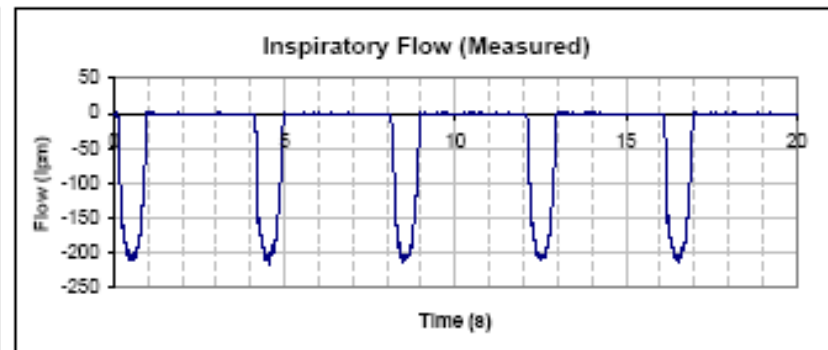
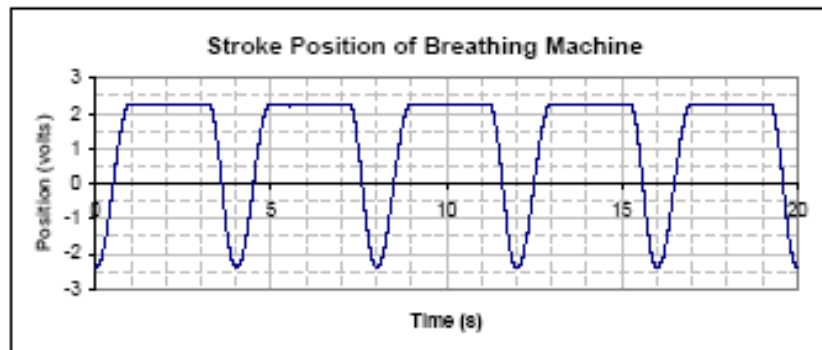
GL

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 8 - Varied Breathing

Rate & Flows

Settings

Breathing Rate (bpm)

15

Stroke Volume (l)

0.33

Test #: 77

Minute Volume (l)

5

Peak Inspired Flow (lpm)

20

Altitude

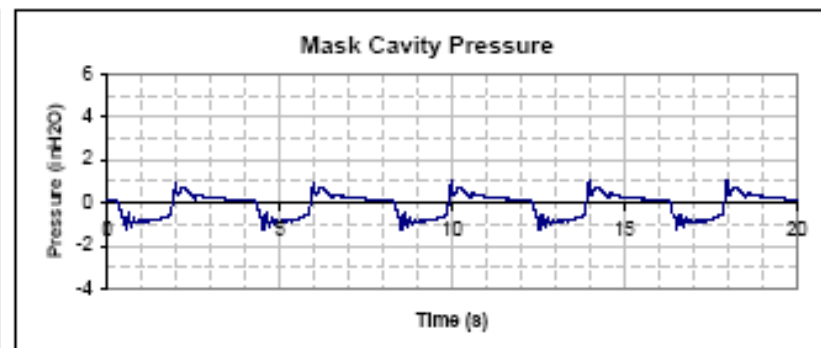
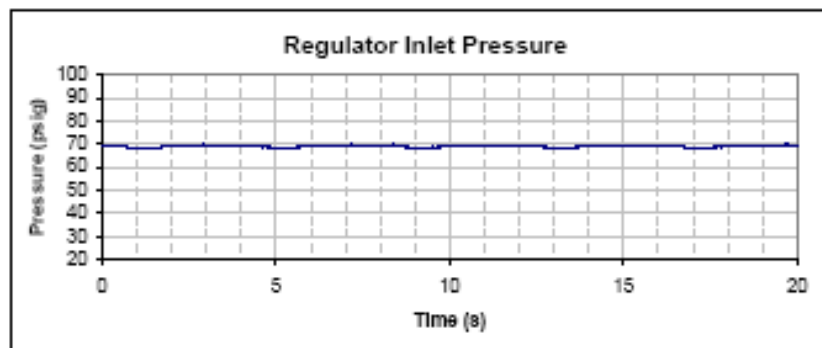
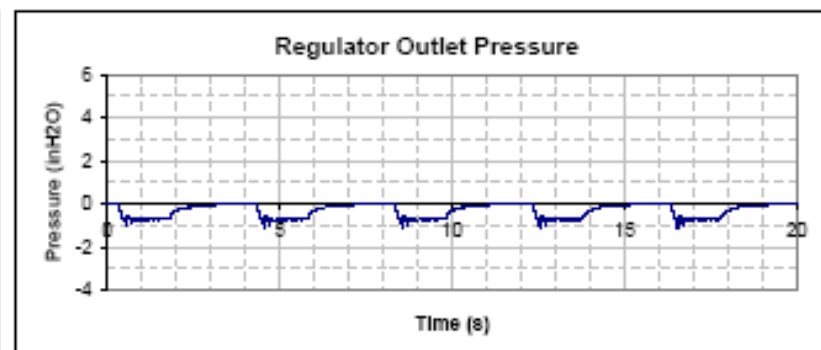
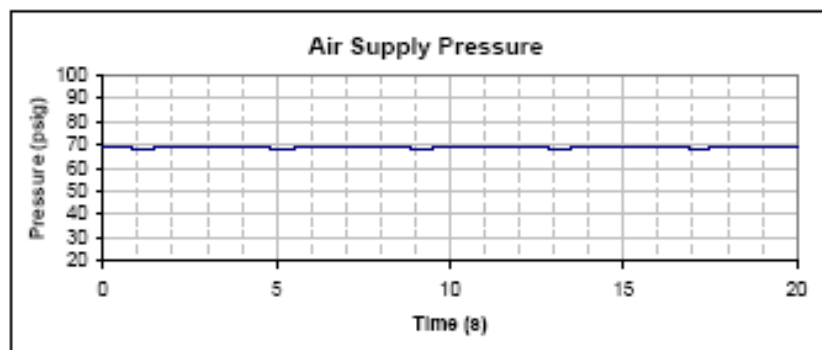
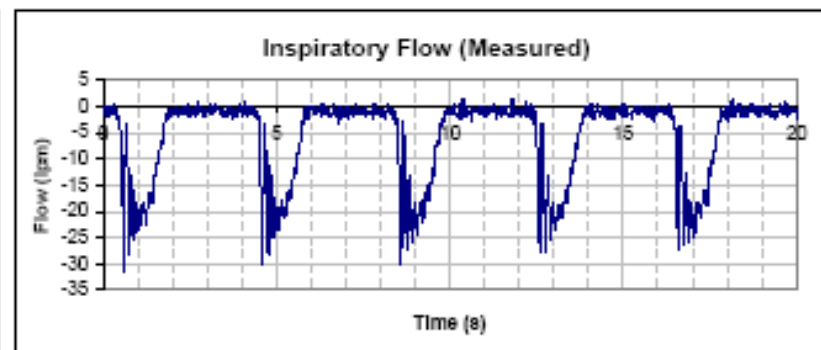
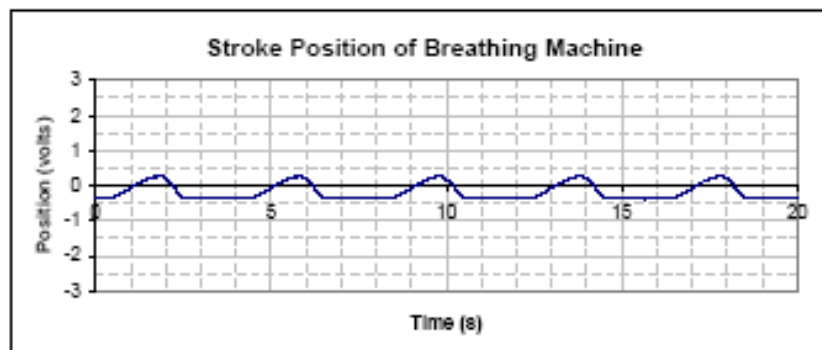
GL

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 8 - Varied Breathing

Rate & Flows

Settings

Breathing Rate (bpm)

15

Stroke Volume (l)

1.33

Test #: 78

Minute Volume (l)

20

Peak Inspired Flow (lpm)

80

Altitude

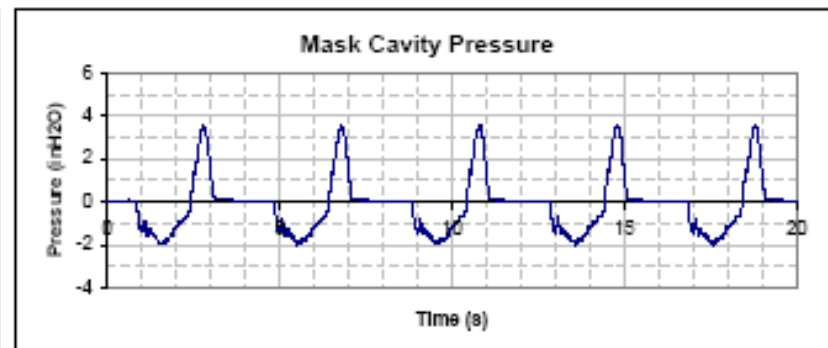
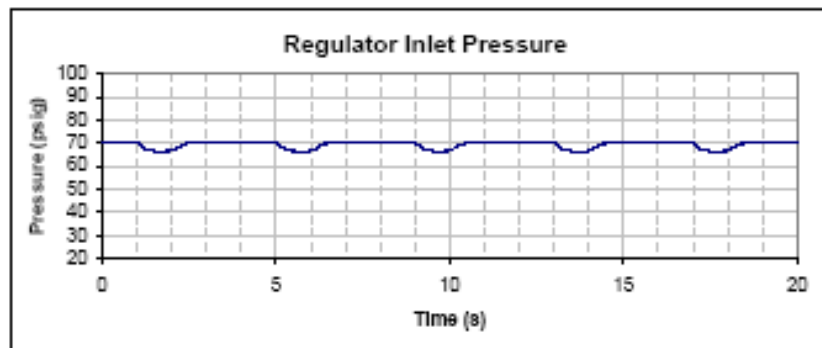
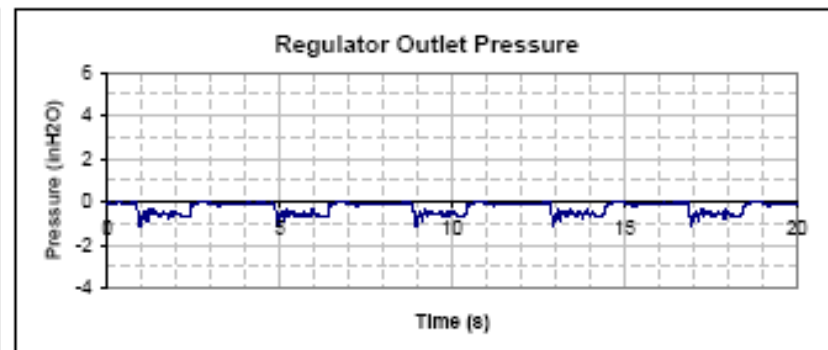
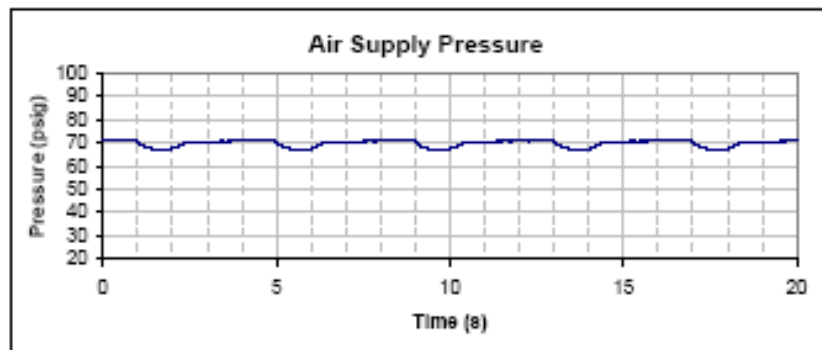
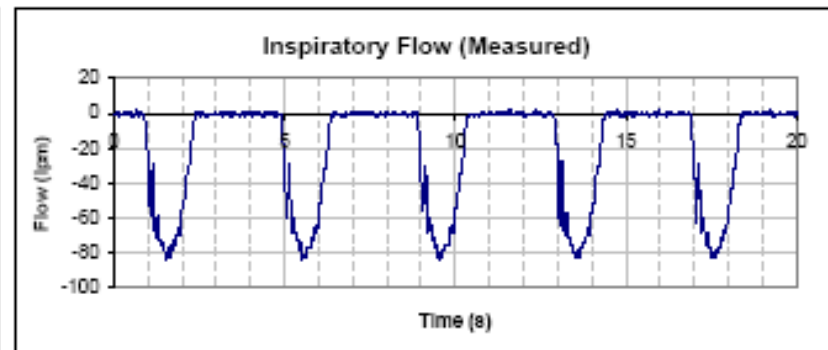
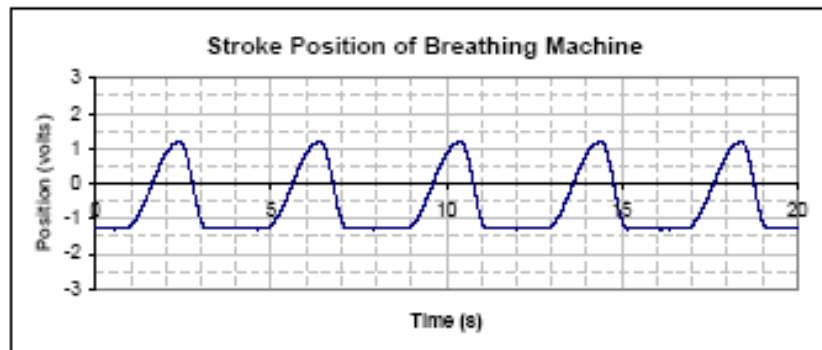
GL

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 8 - Varied Breathing

Rate & Flows

Settings

Breathing Rate (bpm)

15

Stroke Volume (l)

2.5

Test #: 79

Minute Volume (l)

37.5

Peak Inspired Flow (lpm)

150

Altitude

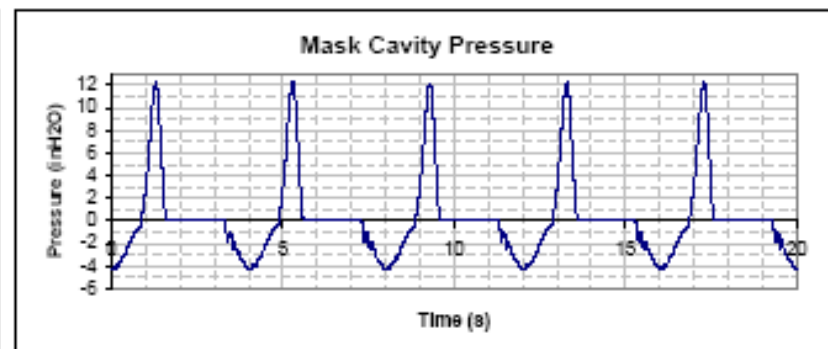
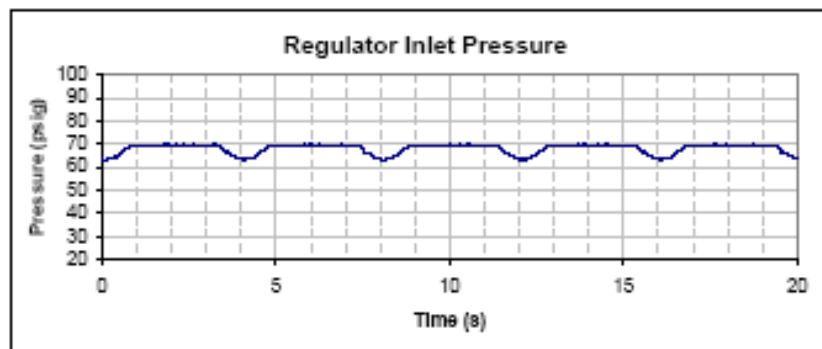
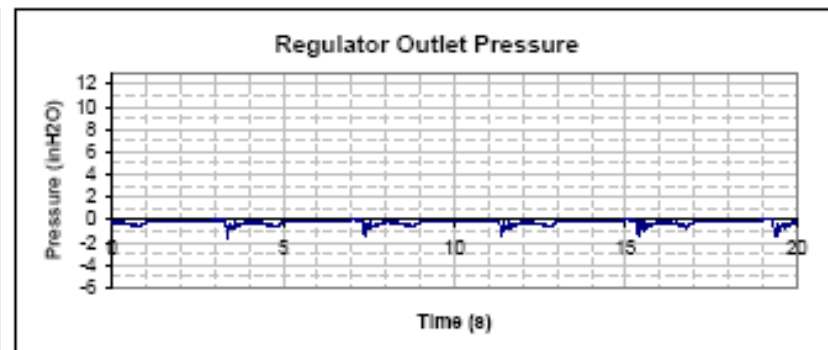
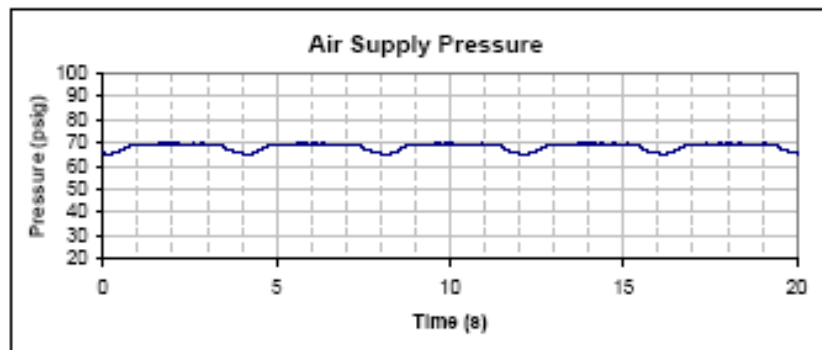
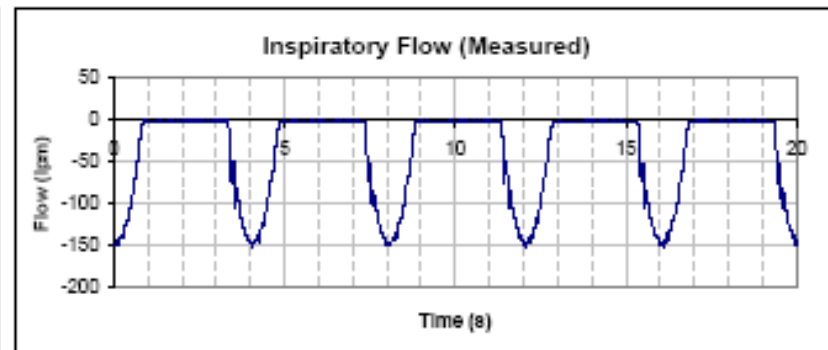
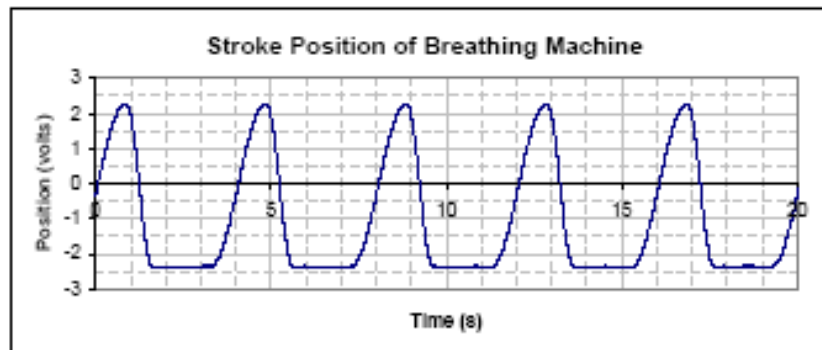
GL

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 8 - Varied Breathing

Rate & Flows

Settings

Breathing Rate (bpm)

15

Stroke Volume (l)

0.33

Test #: 80

Minute Volume (l)

5

Peak Inspired Flow (lpm)

50

Altitude

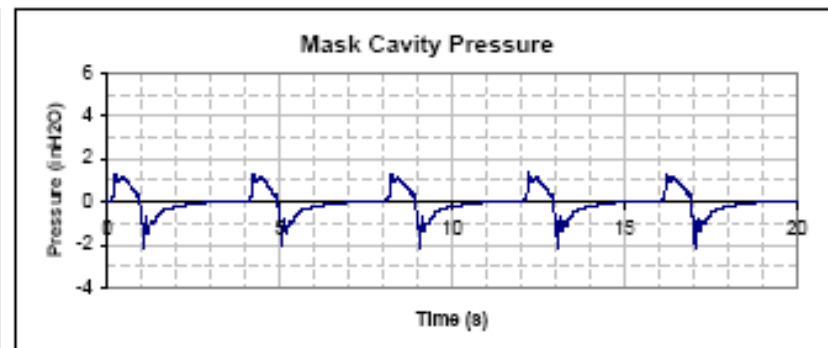
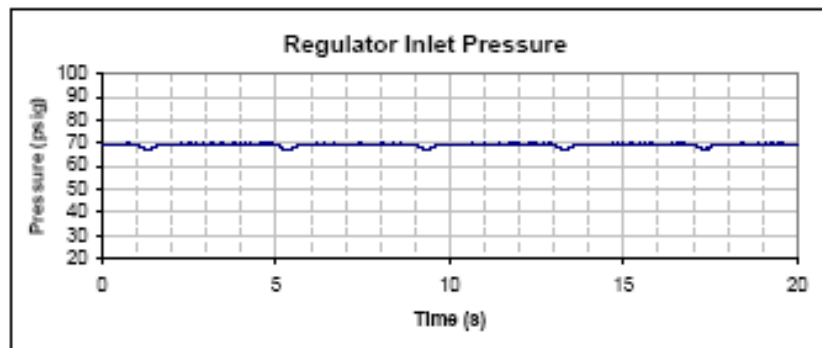
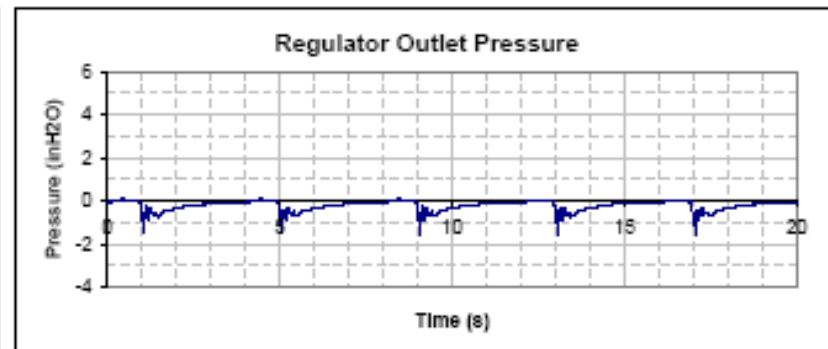
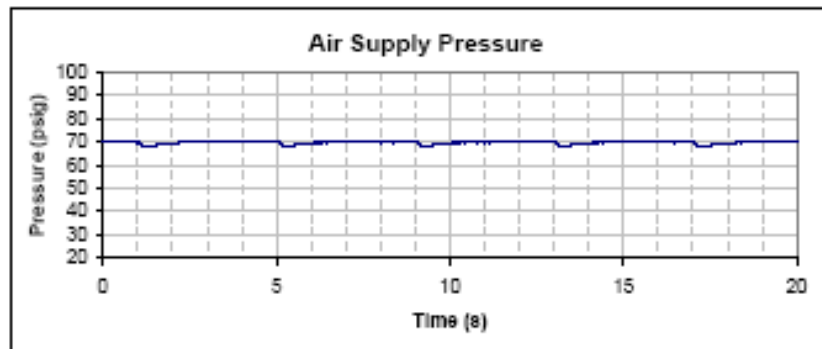
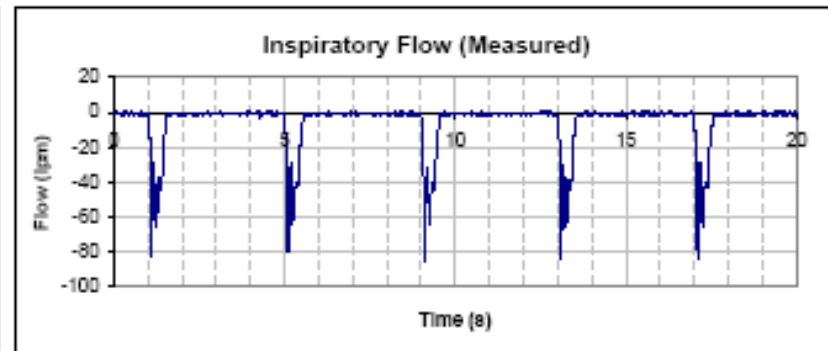
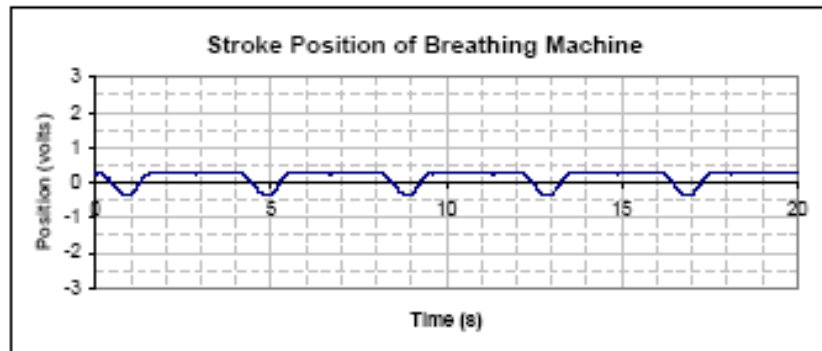
GL

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 8 - Varied Breathing

Rate & Flows

Settings

Breathing Rate (bpm)

15

Stroke Volume (l)

1.33

Test #: 81

Minute Volume (l)

20

Peak Inspired Flow (lpm)

200

Altitude

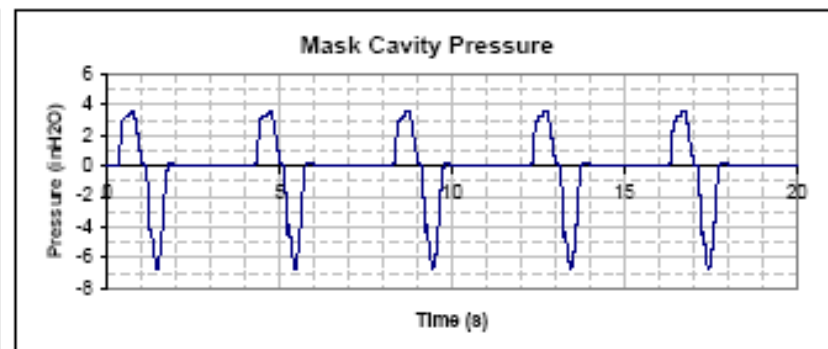
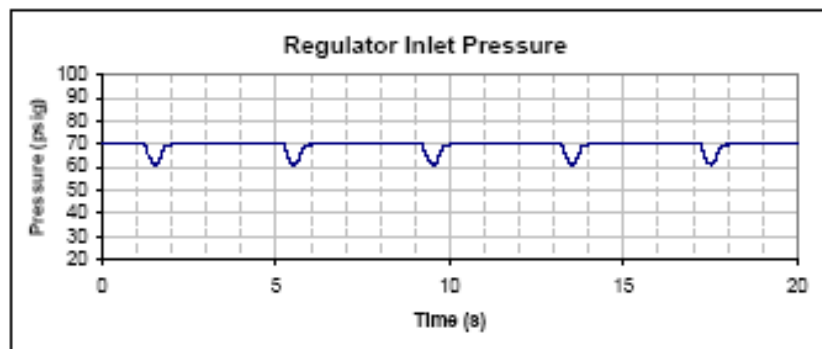
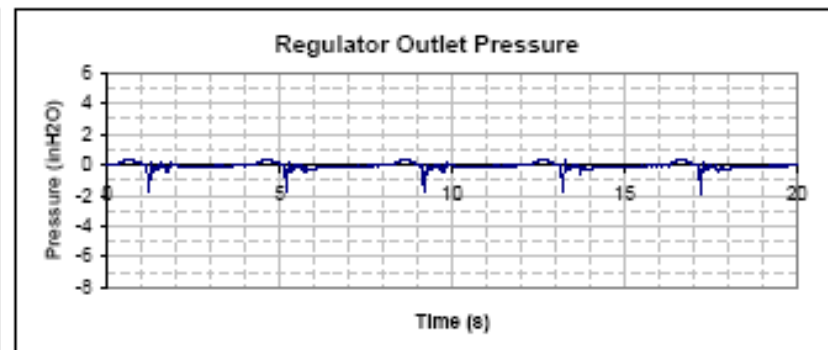
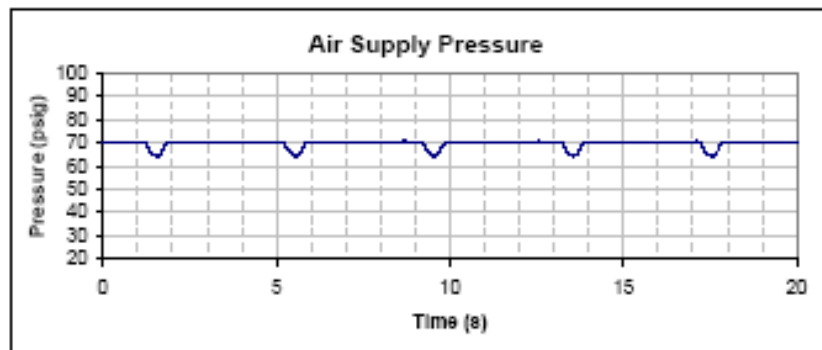
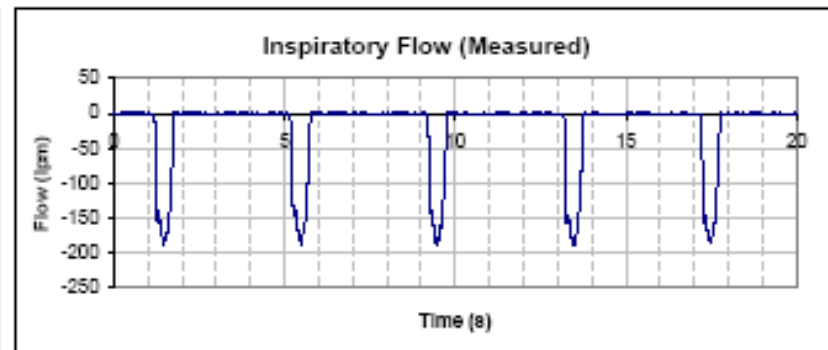
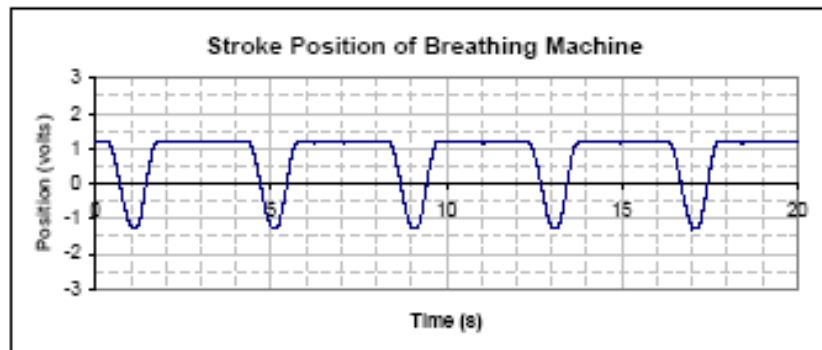
GL

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 6 - Varied Breathing

Rate & Flows

Settings

Breathing Rate (bpm)

22

Stroke Volume (l)

0.46

Test #: 82

Minute Volume (l)

10

Peak Inspired Flow (lpm)

60

Altitude

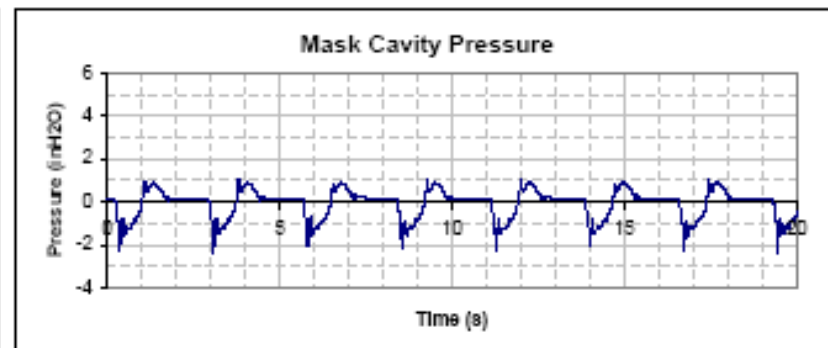
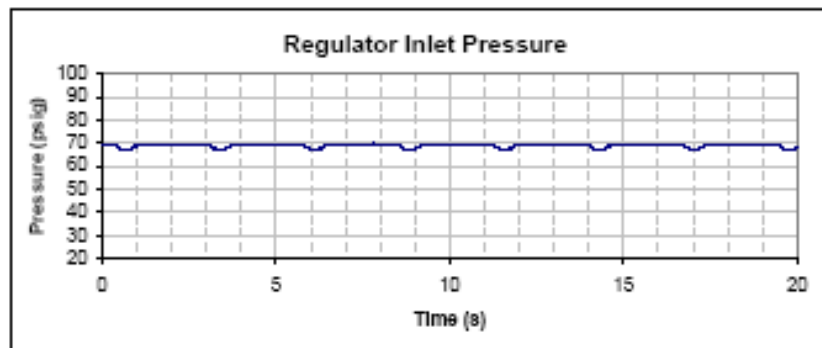
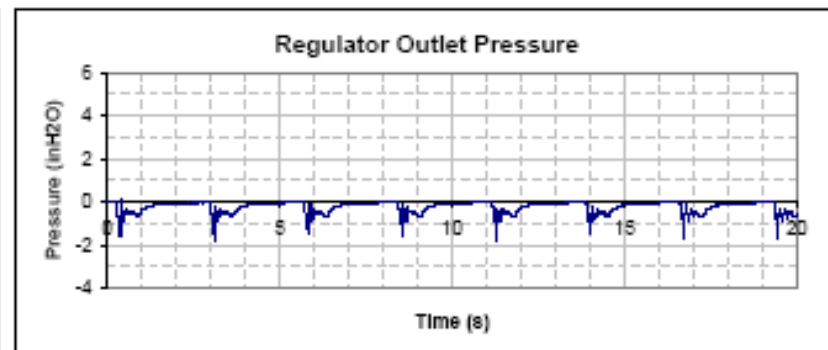
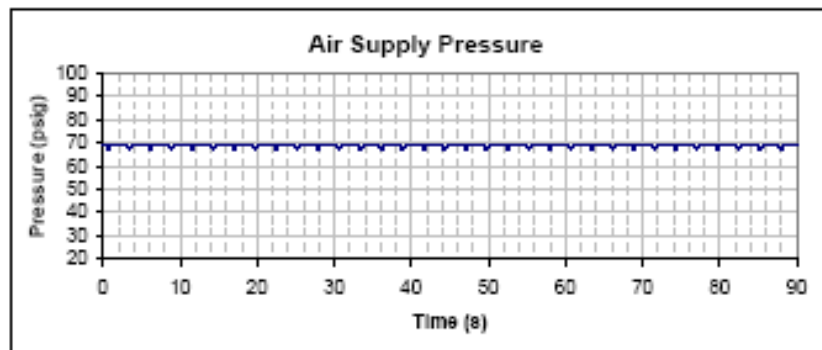
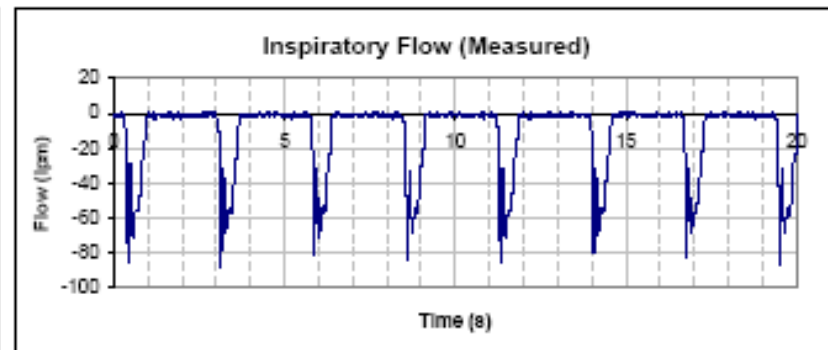
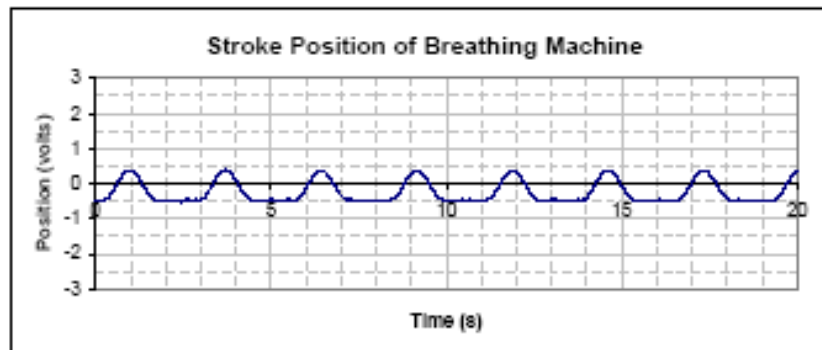
GL

Inlet Pressure (psig)

70

Regulator Mode

Dilution





CF188 Oxygen System Compatability Test - NACES Configuration

Group: 8 - Varied Breathing

Rate & Flows

Settings

Breathing Rate (bpm)

22

Stroke Volume (l)

1.36

Test #: 83

Minute Volume (l)

30

Peak Inspired Flow (lpm)

180

Altitude

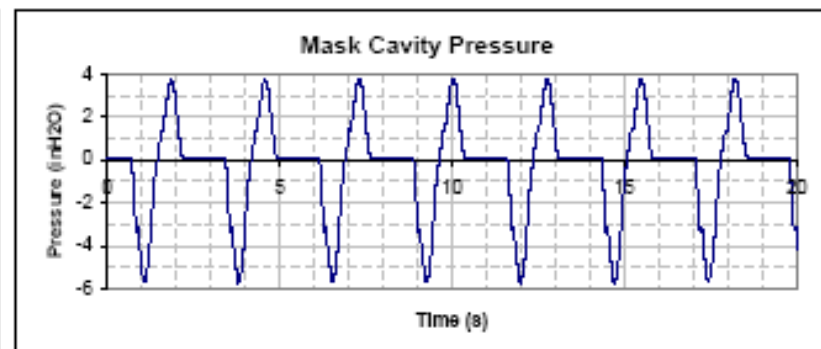
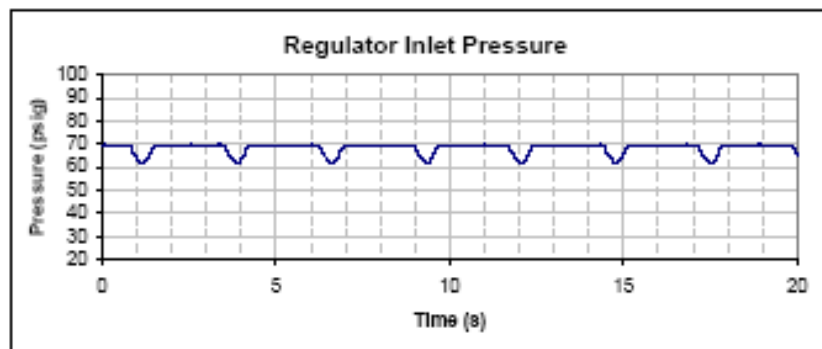
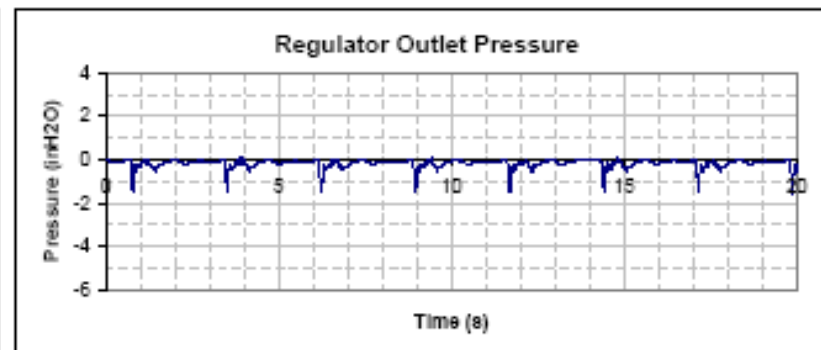
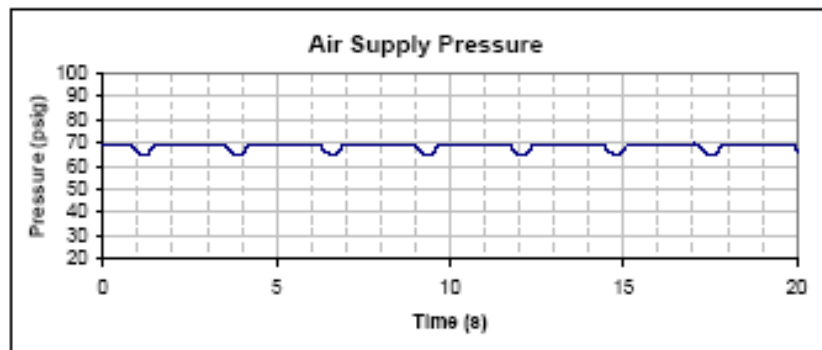
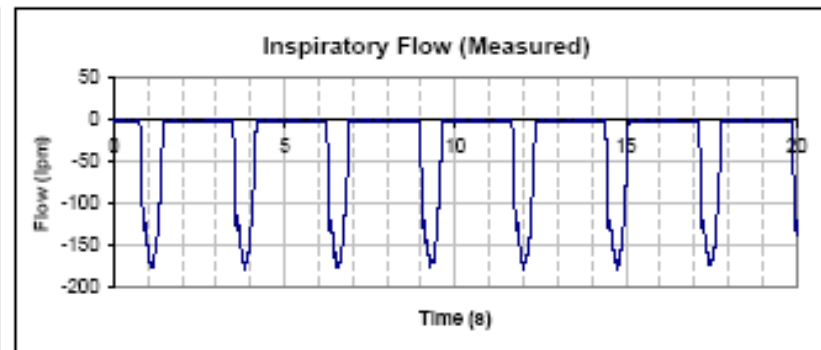
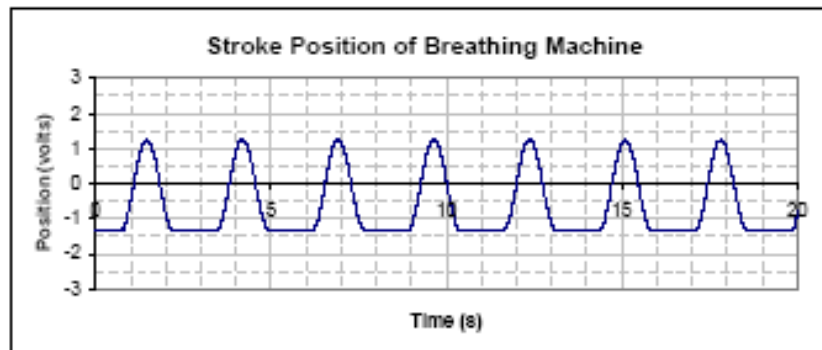
GL

Inlet Pressure (psig)

70

Regulator Mode

Dilution



CF188 Oxygen System Compatability Test - NACES Configuration

Group: 8 - Varied Breathing

Rate & Flows

Test #: 84

Settings

Breathing Rate (bpm)

22

Stroke Volume (l)

1.8

Minute Volume (l)

40

Peak Inspired Flow (lpm)

250

Altitude

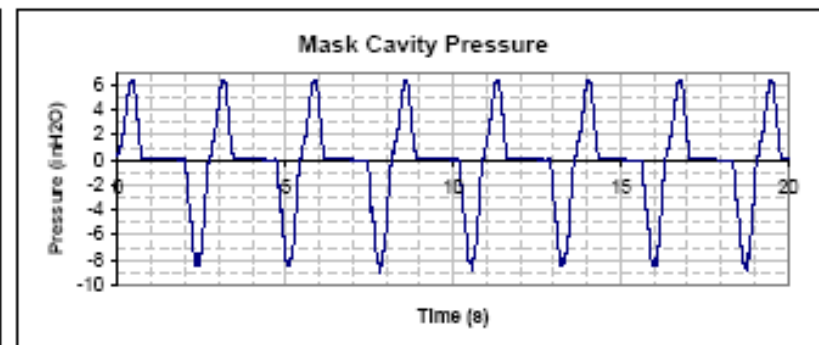
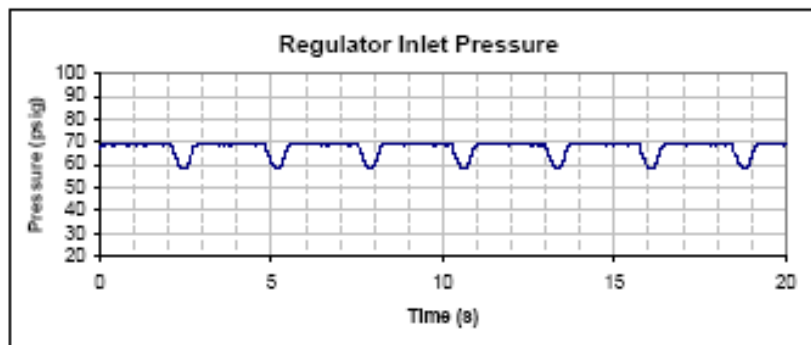
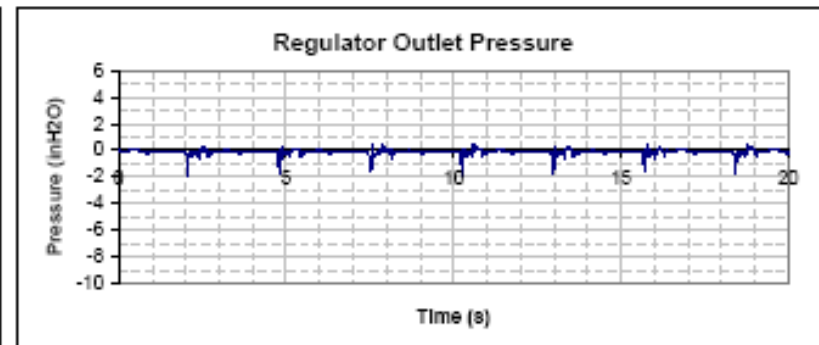
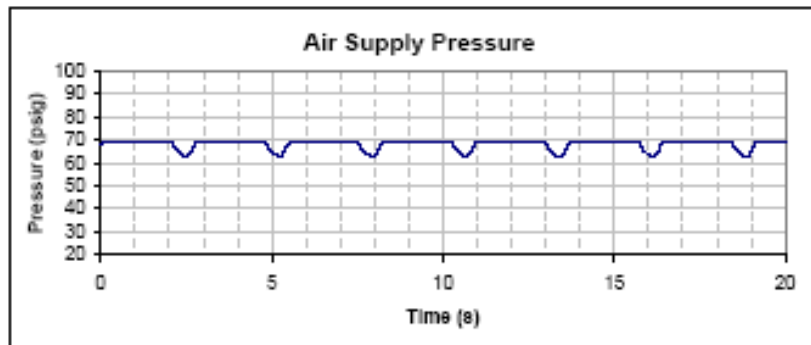
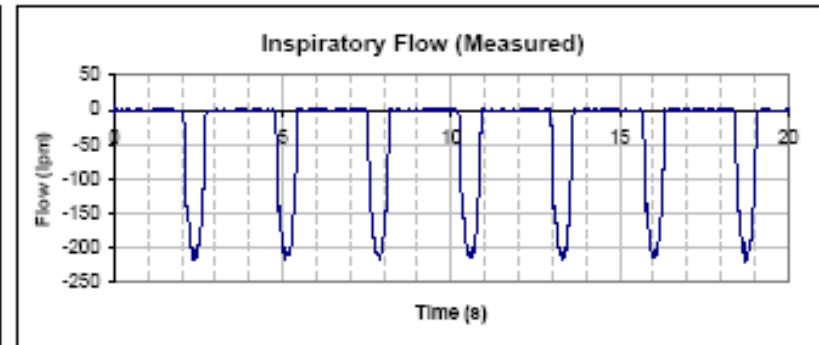
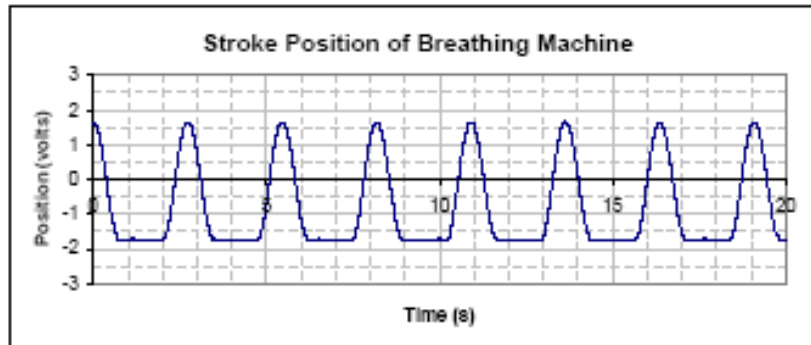
GL

Inlet Pressure (psig)

70

Regulator Mode

Dilution



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<b>4. AUTHORS</b> (First name, middle initial and last name. If military, show rank, e.g. Maj. John E. Doe.)  <b>R. D. Michas</b>		
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(U) A series of 84 unmanned tests of the NACES–configuration CF188 oxygen system were conducted to demonstrate compatibility of system components reflected by acceptable flow and pressure characteristics. Results confirmed acceptable system performance in each regulator mode and over the operating ranges of inlet pressure, altitude and breathing profile, varied both individually and in combination.

(U) French abstract not available.

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(U) aircraft, oxygen system, test, compatibility

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